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Practical Points in Arc Welding

Keeping the Work Clean—Beveling the Edges—Allowing for Expansion and Contraction—Guarding Against Injury—Making Solid Welds

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THE high industrial value of electric arc welding depends as much upon the welder as upon any other element. He must know what he is about. If he realizes the value of a clean surface and how to get it, if he knows how important it is to gage accurately the gap between edges, if he is sure just when to preheat parts to be joined, and if he has in mind a good many other such points which are vital to good welding, the chances are that his work will be highly successful.

Good, strong welds are most readily made only when the metal to be welded is kept clean. Not only does foreign matter contaminate the weld and weaken it, but metal is made spongy due to locking up of the gas generated in making the weld.

Too much care cannot be exercised in preparing the surfaces to be welded, by keeping them free from scale, rust, grease, soot and foreign matter. Washing with gasoline or lye, boiling with lye, pickling (if parts are small), sand blasting, chiseling, scratch brushing and similar methods for cleaning surfaces have been satisfactorily employed, depending on local conditions. A simple method, and one in general use either alone or with any of the other methods, is scratch brushing. In this method, a steel-wire scratch brush is employed before commencing the weld, and also at intervals (usually when changing electrodes) during the welding.

It is just as important to keep the surfaces clean during the welding as it is to clean them before the work is started. The introduction of impurities must constantly be guarded against, and to remove any possibility of contaminating the weld many operators avoid the use of flux. Experience has demonstrated that flux is unnecessary and that, if a good weld is to be obtained, the use of flux will not satisfactorily compensate for a lack in cleanliness of the surfaces. In welding heavy sections where it is necessary to deposit several layers of metal, the surface of one layer should always be cleaned before the next is started.

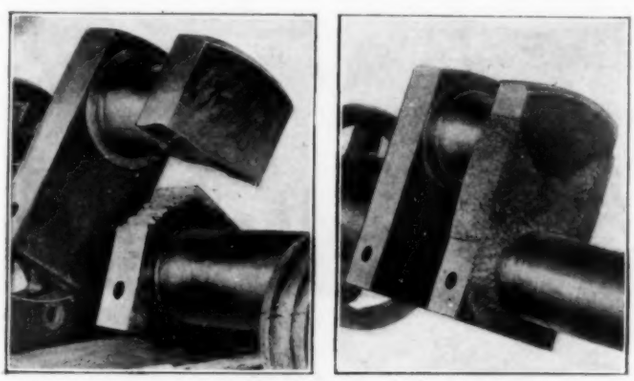


FIG. 1. WELD MADE IN BROKEN CRANKSHAFT

When sections which are $\frac{1}{4}$ in. or less in thickness are to be joined, the edges need not be beveled, but they should be separated a small distance. Thicker sections should be separated by $\frac{1}{8}$ in., and should be beveled so as to produce a total angle of 60 deg. This angle is a safe average value, although the nature of some work may require almost any angle from 40 to 90 deg. Very heavy sections may be beveled from both sides, and to prevent warping, the weld should be made in layers alternately deposited on the two sides. In Fig. 1 can be seen the method of preparing a broken 6-in., six-throw crankshaft for welding, as well as the appearance of the completed weld.

FIG. 2. WELDING BOOTH AND USE OF EYE SHIELDS

In welding cracks in plates, forgings, or castings, the crack should be chiseled out to get a good bevel, entirely through to the back or to the bottom of the crack in castings or forgings. In boiler work, $\frac{1}{2}$-in. holes are sometimes drilled well beyond the ends of the crack, and the crack chiseled, beveled and welded.

Allowing for Expansion

When long seams are to be welded, provision should be made to take care of the expansion due to heating of the metal in the sheet, and also the contraction of the metal in the weld as it cools. At the point where the weld is started, the edges should be placed $\frac{1}{8}$ in. apart, while at the other end, the space allowed should be $\frac{1}{8}$ in. plus $1\frac{1}{2}$ per cent of the length.

Another method of reducing expansion is to put in a short section at the center, and then to add alter-

nately on each side of it other short sections spaced at intervals. All these sections are placed in the first layer. Subsequent layers are then added in such a way that the welded sections of any layer will not match those in the layer immediately below.

In a third method, work is started at some distance in from the edge of the plate, and the weld is made toward the nearest edge. Then a second weld is started the same distance ahead of the first and is welded back to the end of the first section. This method is called back welding. The length of each section depends on the total length and may vary from 4 to 10 inches.

Certain points of flywheels, complex castings or other

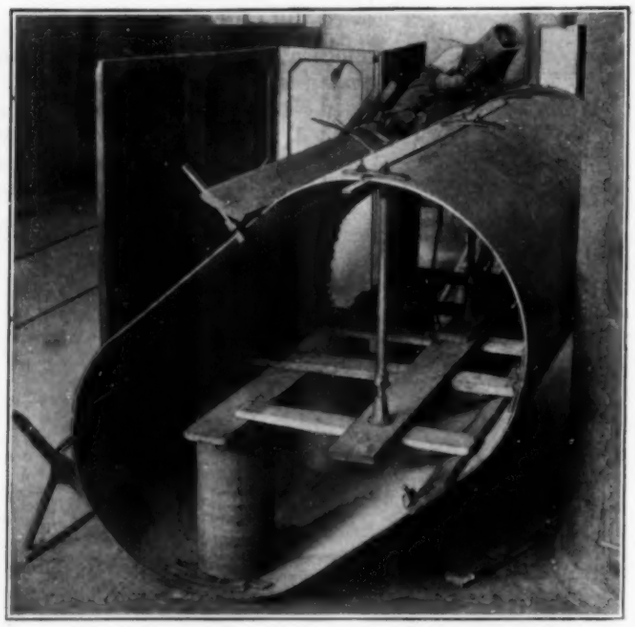


FIG. 3. ARC WELDING A SEAM IN A TANK

objects having complicated shapes may require preheating to produce an initial expansion sufficient to offset the contraction resulting from the cooling of the weld. In some cases, the entire piece should be preheated; in others, the whole piece should be annealed after welding. The desired result can be obtained by heating the piece uniformly, covering it with sand or asbestos, and allowing it to cool slowly.

Contact with Terminals

When work is placed on the steel-covered bench, the resulting contact will be sufficient to carry the current, providing the part to be welded is heavy enough to hold itself in contact. It will be found desirable for holding lighter parts to clamp them securely to the bench or hold them in a vise.

When large pieces are to be welded, the positive lead may be connected directly to them. A convenient terminal for the positive cable can be made by bolting to it a copper hook of proper size. This terminal can be laid on the work, or hooked on any projecting part or into any convenient opening. It is seldom necessary to clamp the terminal to the work, unless the metal is thickly covered with scale or dirt which acts as insulation. Even in such a case, it is easier to chip or brush off a clean place for the contact than to use a clamp.

If welding is to be done in a room where there are employees doing other work, it is advisable to use screens around the welding operator. The screens should be high enough to confine the upward light to a small part of the ceiling, so that its flickering will not affect the other workmen. While such light over a wide area would probably not be injurious, it is irritating to the other employees. Recent experiments indicate that flat battleship gray is the best color to paint ceilings and walls, as this color absorbs practically all of the dangerous light rays.

Safety of the Operator

It is necessary for the operator to take certain precautions against the danger of receiving flashes and burns from the electric arc. Properly protected, the operator is in no danger. Gloves are necessary, leather ones with long gauntlets having been found to give best results. Manufacturers of electric arc-welding equipment usually supply protective devices with their equipment, in the form of either a head or face shield. The welding glass protects the eyes, while the shield proper protects the skin of the face and neck from burns caused by the ultra-violet rays of the arc. Goggles, either clear or tinted, offer additional protection where a number of operators are at work. A welding booth, intended to be closed by a curtain, is shown in Fig. 2, which illustrates also the use of protective shields.

Before the work is started, care should be exercised to see that the electrode holder is connected to the negative terminal, and the pieces to be welded to the positive terminal. Reversed polarity occasions greater difficulty in maintaining the arc, and results in a poorer deposit of metal. Under certain conditions, however, it is advisable to reverse the polarity, such as when welding thin metal and certain grades of cast iron. In such cases it is desirable to reduce the amount of heat on the piece to be welded, this being accomplished by reversing the polarity.

In starting the arc, the electrode should be just touched to the work and immediately withdrawn, to a distance not exceeding $\frac{1}{8}$ in. The arc should be kept short, and to insure uniformity in the metal deposited, should be maintained constant in length. Since metal deposited in welding adheres only to that surface of the work upon which the arc actually plays, care must be used to bring the arc in contact with the whole sur-

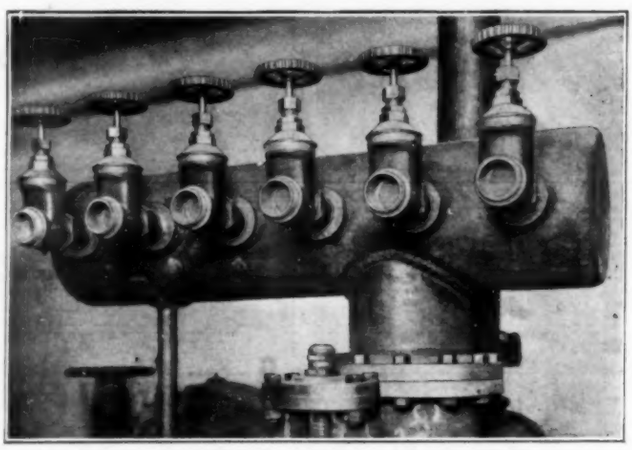


FIG. 4. ARC-WELDED JOINTS IN FEED-WATER MANIFOLD

face to be welded. The metal of the work is fused by the direct impact of the arc, and if the molten metal merely runs ahead of the arc over the solid metal of the work, a good weld will not result.

In welding a seam, the electrode should be advanced

along it in a zigzag or circular path. Where the weld must be smooth on one side, a flat piece of copper or carbon can be held against the weld and the metal filled against it. An iron or steel block can be used, if care is taken not to weld to it. The method of setting up and welding along a seam in a transformer shell is shown in Fig. 3.

In filling holes in castings or plates, a common method employed is to tack a piece of ¼-in. plate at the back of the piece to be welded, completely covering the hole. This plate greatly facilitates filling the holes, and can be readily removed with a chisel and hammer. If a copper or carbon backing-up piece is used, the metal should be flowed against the piece, care being exercised to prevent the arc from coming in contact with the copper or carbon, thereby contaminating the new metal.

Overhead Welding

Overhead welding with a metallic electrode is accomplished in the same manner as normal welding, and except for the difficulty of holding the electrode steady in the cramped position usually required, is just as easily effected. Metal will be successfully deposited if the length of the arc is kept constant, and this is simply a matter of practice. A rest for the arm will sometimes assist the operator to hold the electrode steady. It will be found desirable for the operator to use a head mask in making overhead welds, so that he will have both hands free.

The appearance of some overhead welds is marred by projecting drops of metal or by uneven thickness of the deposited metal. This can be prevented by a proper manipulation of the electrode. Fig. 4 is a good example of what can be done by arc welding, all the joints in the manifold being made in that manner.

If at any time, the electrode is held in contact with work so long that the two become welded, the circuit should be opened and the electrode knocked loose.

The Payment of Unemployment Relief

By C. J. Morrison

In an article under the above title on page 1001, Vol. 55, of the American Machinist, John S. Watts, gives a very comprehensive treatment of the question of payment of unemployment relief, but no solution of the problem is offered. Possibly Mr. Watts does know the solution. I am frank to say that I do not; and a number of very able statesmen, after devoting much time to the question, have acknowledged defeat. Yet the problem is of the utmost importance and a solution must be found.

Selfishness One of the Obstacles

There are many obstacles to be overcome, probably the greatest of which is the inherent selfishness of nearly all human beings. Most of us are willing to help others after we have provided for ourselves, and unfortunately this condition is progressive and the better we provide for ourselves the more we think we should have before being called upon to share with others. Especially do the thrifty object to being penalized to help those who are not thrifty. Consider two men in the same locality earning the same salary and supporting the same number of dependents; one spends all he earns and lives in luxury while the other lives modestly and saves part of his income. Then comes a business depression and both are thrown out of employment. The man who has spent all needs immediate assistance, while the one who has saved can get along for some time without help. The thrifty one does not like to see his savings eaten up by the necessity to live, but he particularly dislikes to have part of this money used to help his unthrifty neighbor.

If employers withhold a part of the earnings of each employee for unemployment relief, almost the same obstacle is encountered as the thrifty feel that they would prefer to handle their own funds, while the unthrifty want all of their earnings each week so that all may be spent; and both classes are discontented. This difficulty is real, not theoretical.

Great difficulty attends the setting of the amount of relief to be paid. An amount sufficient for one will not care for another. A single man requires less than a man with a family, but if men with families are allowed a larger amount than single men, another obstacle is added to the already great difficulties, as employers will object to hiring family men. In some places, employers give preference to single men on account of the accident compensations and there are other laws which discourage the raising of a family. In Massachusetts the income tax law seeks to prevent any increase in population by limiting the exemption for children to two.

Problems of a Relief Organization

Other obstacles are almost as difficult to surmount and a vast organization would be required to handle the unemployment relief. Who would support this organization? Men out of work in one place might be able to secure employment in another section of the country, but who is to pay for the transportation and, in the case of men with families, what is to be done? A man might not be able to support himself in one place and his family in another, and may not have the money to move them. Will money be supplied to move the family or will unemployment relief be paid until some other arrangement can be made? Also the family might refuse to move.

Who is to decide that a man cannot find suitable employment and what constitutes suitable employment?

Suppose a man works a number of years for one concern, then makes a change only to be thrown out of work within a few weeks. Which concern pays the unemployment relief?

Increased Industry the Solution

Who would pay the relief to domestic servants? When a large number of them are out of work it is because their usual employers are financially unable to hire them and consequently could not pay either wages or a compensation for unemployment.

There are innumerable ramifications of these and other difficulties, but it is needless to go into them as enough has been said to show the almost unsurmountable obstacles in the path of unemployment relief. At present the best procedure seems to be to attempt no payment of unemployment relief, but for our great leaders in business and finance to set manfully to the task of setting in motion the wheels of industry. There is more work to be done than all of us can do, but someone must solve the problem of how to start the machine. Once started it will quickly gain momentum and there will be no question of the payment of unemployment relief for some years to come, and possibly by that time someone will have solved the great problem of its administration.

Building Up Teaching Ability in Foremen

Why the Average Foreman Is Not a Good Teacher—Importance of Planning the Teaching Work—What Constitutes Good Teaching

By D. J. MAC DONALD
Professor of Vocational Education, University of Cincinnati

SOME extremely significant statements having to do with the causes of low production have been made during the past decade or so. The truth of some of these should doubtless be questioned; but not so the majority. Allow as liberally as one cares to for the results of sinister influences during the stress of war, and he is still forced to admit that the charges must be more or less just. Productively speaking, we are far from what we might be or should be. And if reports are at all reliable, management is certainly much more to blame for this than labor.

The following statements indicate the need for increased managerial ability. The first is from Gantt's well-known book on "Organizing for Work." "It has been clearly proved that poor workmen are much more apt to migrate than good workmen, the natural conclusion being that if we wish to make workmen permanent, our first step must be to make better workmen of them. Our experience proves this to be correct. . . . Money spent in the proper teaching and training of workmen is a highly profitable investment for any industrial concern provided there is some means of measuring and recording the result. So beneficial have our training methods proved that we are inclined to believe that the practice of stealing good workmen from one's competitor will ultimately prove to be as unprofitable as stealing his property."

Cause of Inefficiency

The second is the oft-quoted statement made by the U. S. Training Service. "One of the principal factors in labor turn-over is the failure of manufacturers to obtain from their workers a full measure of efficiency. That this failure is chiefly ascribable to employers themselves is rather eloquently indicated by the results of a recent analysis of various causes of discharge in one of our big establishments. Only ten per cent of the dismissals, this study showed, were upon grounds of slacking. The other ninety per cent were attributable to shortcomings of one sort or another in the management. The same kind and degree of failure were responsible for ninety per cent of the quittances among employees according to another survey. Six general reasons may be assigned for inefficiency in production—and five of them are furnished by imperfect management. These reasons are (1) power failure, (2) failure of equipment, repairs, etc., (3) lack of instructions, (4) failure to supply material, (5) lack of training, (6) personal slacking."

The third is from the 1921 report of the National Association for Corporation Training. "There is no longer a need for argument in favor of training of skilled and semi-skilled labor. As a nation we are committed to a program for vocational and trade training. But the fact that the need for such training is generally recognized does not at all warrant the assumption that any considerable proportion of our industries have solved the problem. It is true that many concerns are undertaking to give their new men some introductory training and older men some additional training, but the fact still remains that few industrial or commercial concerns have attacked the problem in a scientific manner. *It is still true in most establishments that the only teaching or training which is given, is given by foremen and it is equally true that the average foreman considers that this teaching and training is the least important part of his job.*" (The italics are mine.)

The Gift of Imparting Knowledge

That one must know the thing he is to teach has long been an accepted fact; but not so the fact that knowing anything does not of itself qualify one to teach that thing successfully. To one who has studied methods of dealing with human beings, even though he has never given time to the study of psychology and pedagogy, this is easily conceivable; but to the practical man, the one who has made good because of steady work in the school of hard knocks such a statement carries little, if any, weight. Since practice makes perfect, according to his way of reasoning, does it not follow that years of experience in trying to teach those under him have necessarily caused him to become an expert teacher? The prevalence of this very fallacy has thus far proved to be one of the greatest obstacles in the way of training foremen to teach their men according to sound pedagogical principles. In the words of the humorist, "they know so damn much that ain't so."

To obviate misunderstanding I shall indicate briefly what is meant by developing teacher foremen. Brown is a typical foreman in a machine tool shop. On Tuesday, say, it falls to him to teach Jim, a new employee, how to turn out a certain piece of work. Being the usual type of foreman, Brown proceeds to show Jim just how to set up the machine, to adjust the work and so forth in order to turn out the right product. His demonstration is what might be called a running one, i.e., it consists of several distinct phases, each accompanied by more or less appropriate remarks. In due time he completes the work and, of course, expects Jim to proceed on the next piece without delay or difficulty.

But it so happens that Jim is typical in nature also—in other words, his mental machinery runs true to form, and as a consequence he cannot recall the various operations together with the numerous directions in their proper sequence. Because of this he is strictly "up against it," he cannot go on. What does he do? That all depends upon how human his foreman is or rather how human Jim thinks he is. To avoid what he expects, a "cussing out," he may try stalling for a few minutes until the foreman goes away, after which he may seek aid from a fellow worker; or, he may be bold enough to say he cannot recall all the points, etc. and ask the foreman to stay with him while he tries to go through the job. Obviously the number of possibilities is legion. The main point is that Brown's poor teaching is primarily to blame for the non-productive situation faced. Either Brown must be trained so that he knows how to teach Jim properly, or Jim must be transferred

to a special training department where there is some one who knows how to teach.

In the following paragraphs I shall attempt to indicate some important problems which have arisen since my department has been engaged in developing teaching ability in foremen; likewise, some of the questions which, so far as we are concerned, are still unsolved. It goes without saying that notwithstanding our firm conviction that the work may be made invaluable to both the foreman and plant manager it is not by any means to be looked upon as a panacea for all industrial ills. On the contrary it should be regarded as one of the many ways of helping to answer some of the great human relationship questions, those questions which it is now generally agreed are mainly responsible for our industrial ills. The time will soon come when that important phase of the foreman's job which has to do with managing men will be valued at its true worth. In fact, there is already a liberal sprinkling of industrial and commercial establishments which evidently fully accept Gantt's statement that "the era of force must give way to that of knowledge; and the policy of the future will be to teach and to lead to the advantage of all concerned."

In view of this small but praiseworthy beginning, one cannot be accused of being unduly optimistic when he says that in the not distant future, whether or not a man qualifies for a foremanship position will depend increasingly more upon his ability to manage men satisfactorily, and correspondingly less upon his ability to bully them into temporary submission. Running close competition to the foregoing qualification from which in reality it cannot be separated will be that of ability to teach, to put ideas over to the other fellow effectively.

Putting the Job Over

Necessary to success in building up teaching ability in foremen is an understanding of what may be termed the psychology of the foreman. It must be understood, for instance, (1) that, with few exceptions, since he was preferred over and above his former colleagues for the position he now holds, he has every reason to believe that he is a success. And this, it may be noted in passing, is equivalent to saying that in the mind of his managers he not only knows how to manage those under him but also how to put ideas over to them; (2) that a person with his schooling and practical experience is not likely to be a good analyst; that rather he is almost certain to be the type of person who bases his conclusions upon the results of unrationalized experience, (intimate contact with hundreds of foremen as well as the testimony of others has not given me reason to change the foregoing belief); (3) that practically every experience he has had for years influences him toward overestimating the value of practice and correspondingly underestimating the value of theory; (4) that almost invariably he has acquired numerous habits which must be located and eliminated before he can hope to teach acceptably; and (5) that because of his maturity, important changes in his habits will be accomplished only after long and persistent effort.

The foregoing principles, I repeat, must be understood; but more than that, they must be observed. That is to say, for the person undertaking this type of work to understand thoroughly any one or all of the above principles will avail little if anything unless he also reacts correctly to practical situations which involves these principles.

To carry through a program of this type requires time and much of it. Just as absent treatment is tabooed elsewhere so hurried treatment is here. Habits of all kinds and in all stages of development must be reckoned with. Correct habits can no more become established quickly than bad ones eliminated quickly. A campaign, well-organized and well-executed, affords the only possible ray of hope. Anything in the way of a "short horn" course, to borrow the agricultural term, is sure to result in failure.

What to Put Over

When men have been engaged for years in a type of business where nothing but production has been dinned into their ears; where, in fact, ability to get out a product in a stated period is the chief gage of their efficiency, and where, as is more often than not true, their superiors have considered policies in terms of their immediate rather than of their ultimate effect, it is not surprising that only occasionally can a foreman be found who has the faintest conception of what constitutes good teaching. In view of this, the first necessity is to try to make clear to them what teaching jobs are. This, on the face of things, might seem to be especially difficult, but such has not proved to be the case. In fact, it is rather easy when compared with the job of making clear how teaching ability is essential to highest success and wherein one kind of teaching is superior or inferior to another. I recall in this connection the experience a friend had when he suggested to a foreman of long standing that possibly a careful analysis of the jobs for which he was responsible might result in discovering improved methods of doing the work. The not unexpected response was: "Why, I've been working at this job for over eleven years. Do you think that you can tell me how to do it?"

But when my suave and politic friend replied that he had not thought for one minute that he could tell him how to do his job better, but that, since by careful analysis he and many others had had their eyes opened to unseen possibilities, he was wondering whether it would prove true in this case, the man "thawed out" and proceeded to demonstrate exactly how he inspected the work in his department. As he proceeded my friend carefully jotted down the various operations as they were performed. Imagine his surprise, after eleven minutes had elapsed, to see the man scrap the casting he had been inspecting with the remark: "There's no use going any further; that blow hole settles that." When asked to make an accounting of the eleven minutes consumed in finding that he didn't need to inspect the article he was at a loss as to what to say. But finally he admitted that the joke was on him. He had been working at the job eleven years without having discovered that one order of procedure in inspecting is better than others.

The point I wish to emphasize through the above incident is not that the foreman and those working under him had been working inefficiently for many years but that his outstanding weakness, his uneconomical method of inspection, was located by means of systematic procedure within the space of a few minutes. Also, that since his work had been considered favorably and since he had never acquired the habit of close analysis he would in all probability have continued his wrong method indefinitely. He lacked the ability to stand aside and get a new perspective of his job.

(To be continued)

Making the Mack Brake Shoe

Fixtures for Holding the Castings in Milling, Boring and Drilling Operations—Rivet Holes for Lining Drilled in Pairs—A Counter-Balanced Fixture

By FRED H. COLVIN
Editor, American Machinist

THE brake shoes are a particularly important part of any motor vehicle and particularly of a large truck. Those used in connection with the dual reduction axle on the Mack truck are manufactured in a rather interesting manner.

The first operation is straightening on a 50-ton press, after which the side is faced on a Bullard vertical turret lathe. The brake cam and brake pin bosses are then milled to size in a Cincinnati duplex milling machine provided with a special holding fixture, after which the brake pin hole is drilled and reamed and the casting sawed apart through the brake pin hole on a knee-type milling machine.

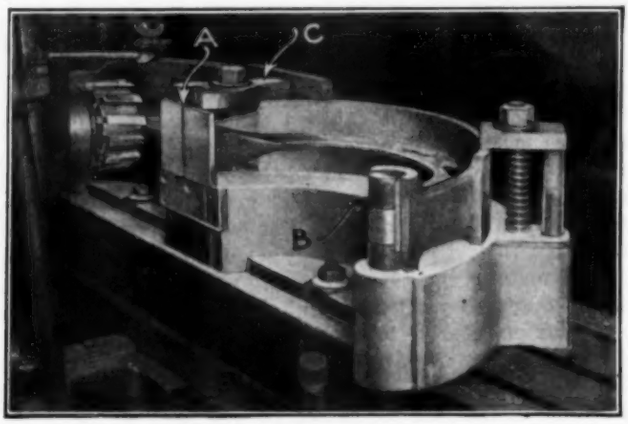


FIG. 1. MILLING THE CAM FACES

The webs which were cast in place to help hold the two parts together are also sawed off, and the cam faces are then milled on the Cincinnati automatic, single-head milling machine, shown in Fig. 1. This machine carries a double fixture so that both cam faces can be finished at one setting, as at *A*. The two halves of the brake shoe are located by means of the pin hole on the two studs, one of these being shown at *B*. Simple clamping fixtures, including a double compensating clamp at *C*, make it easy to put the brake shoes in place and to remove them with little effort, all of which assists in securing a satisfactory production.

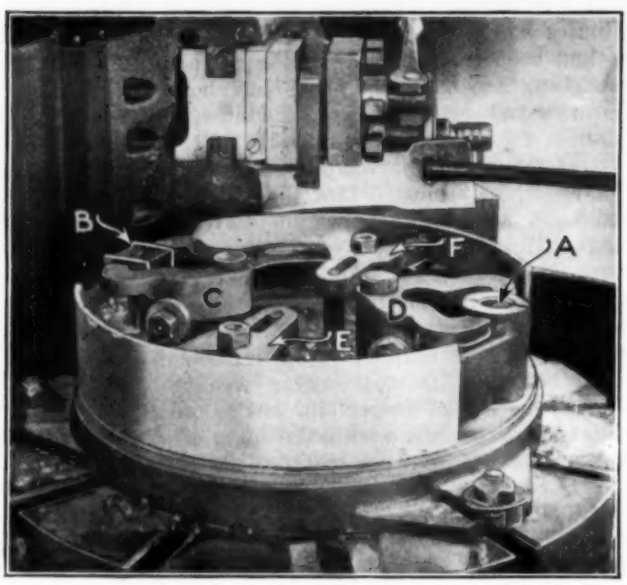


FIG. 2. TURNING THE OUTSIDE

The two parts are then taken to the Bullard vertical turret-lathe shown in Fig. 2 and positioned by a stud at *A* and the block *B*, which represents the brake cam in its release position. The clamps *C* and *D*, then draw the two parts firmly together against *A* and *B*. The other clamps, *E* and *F*, hold the brake shoes down on the face of the fixture for the turning operation. It will be noted that provision is made so that clamps *E* and *F* may slide easily toward the center, releasing the work and at the same time always being in position for immediate use.

The type of equalizing clamps shown at *C* and *D* are particularly useful where it is necessary to contend with the inequalities found in the average casting. There are many places where their use will save imposing unequal stresses on parts which are sure to spring after the pressure is released.

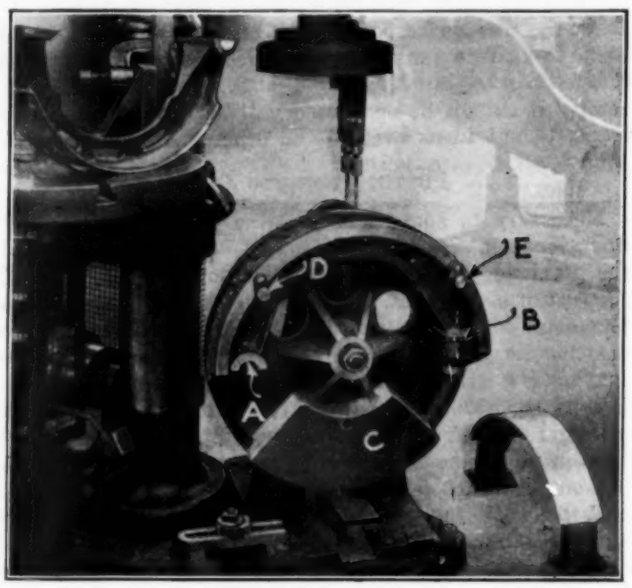


FIG. 3. DRILLING THE RIVET HOLES

The brake shoes are then drilled with eighteen No. 19 holes for the brake lining rivets. These holes are drilled in pairs, as can be seen in Fig. 3, by the special two-spindle drilling head shown. The shoes are here located both by the pin hole *A* and the cam face *B*, and as the fixture is counter-balanced at *C*, it is easy to turn it so as to bring any desired pair of drill bushings under the drill. The small swinging clamps *D* and *E* hold the brake shoes in place during the drilling operation.

The holes are then countersunk, all burrs are removed and the brake shoe is ready for inspection.

Waste Elimination Through Standardization

Reducing Manufacturing Costs—How Standardization Benefits Both Manufacturer and Consumer—Introduction of a Universal Numbering System—Multiplying Service by Six

By H. CAMPBELL and ALEX TAUB

WHAT is becoming one of the most important considerations in modern manufacturing from the point of view of both manufacturer and consumer, is the item of standardization. Apparently the first recognition of the benefits of standardization in manufacturing was shown by the Association of Licensed Automobile Manufacturers. During later years, the Society of Automotive Engineers has given to the automotive industry, through its members, a series of standards which have been widely adopted. It has remained, however, for the General Motors Corporation to greatly develop standardization.

There exist in the United States today 360 manufacturers engaged in the production of automotive parts. Among these are manufacturers who specialize in bolts, nuts and washers and who make these parts to conform to accepted standards which are used by general agreement and by recommendations from the various engineering societies. In the majority of cases these parts, usually grouped as standard parts, are thoroughly standardized as to diameter, head and fit, but vary in the matter of length. Thus, in spite of the splendid work of the S. A. E. and others, the benefits of standardization have not been felt fully by the ultimate consumer so far as service is concerned.

Without doubt the finest example of service through standardization is to be found in the building trades, whereby every hardware store has become, in effect, a service station. It is the opinion of General Motors engineers that to a certain extent the servicing of small parts for automotive use should be just as simple.

In the analysis of the situation, it was noted that 70 per cent of the parts used in an automobile were small parts that could be and should be standardized. On this basis data were prepared and placed before the engineers of the corporation to show how far it is possible to carry interchangeability.

Part Duplication Eliminated

Although it seemed that interchangeability could be accomplished without much difficulty, yet the actual tabulation of data required a tremendous amount of labor. There were many problems to be settled, among which was the apparently unimportant numbering system. It was necessary to devise a system that could be used by all divisions of the corporation without confliction with past history, and naturally the key system was thought to be the best. However, after considering the number of parts included in this group, it was found that the key would be equal in size to the volume containing the data, and therefore a straight numbering system was adopted. No division of the corporation was at that time using six-digit part numbers; therefore, six-digit part numbers from 100,000 to 150,000 were decided upon for the standard parts group and in this way a rather troublesome feature was eliminated. In the opinion of the standards department of the corporation a numbering system that could be successfully introduced into thirty organizations could be used without difficulty by every organization in the country.

Consideration was then given to the varying values of cars and the tolerances necessary to fit these different conditions. This problem was solved by the fact that where high production is in effect, fine tolerances are necessary in order that production will not be hindered by poor fits. On the other hand, where high value and small production exist fine tolerances are desirable.

When the tabulation of the data was completed and compared with the data at the various divisions of the corporation, it was found that many parts were duplicated. In one instance a division reduced the number of parts from 1,600 to 78; another division from 3,400 to 1,600. It was discovered that one plant used 349 kinds of nuts, an almost inconceivable condition, and these were replaced with sixty-five. In such a case the manufacturer could save in bins alone, to say nothing of the possibilities offered for better service to the public. This condition is bound to exist in every concern that does not create a self-imposed barrier, as parts that have become service parts are hidden from view and similar parts are brought out as new. And so we find in some instances as many as seven parts exactly alike under seven part numbers, in seven bins. Within the first year it was possible to decrease the number of parts listed in the book from 13,000 to 2,100.

Simplified Service

Many evils became automatically eliminated with the adoption of standards. For instance, in ordering parts it was necessary for the source of supply to secure specially rolled bars from the mill, and when these parts became service parts, they were no longer obtainable.

It is the intention of the General Motors Corporation to effect a maximum interchangeability of all small parts where it is possible to do so without retarding the development or efficiency of the unit; and to so record these parts that they can be readily used by any division without destroying their original identity. When these parts enter the field they will be available as service parts at no fewer than six sources of supply.

The corporation engineers have further recognized the possibilities for interchanging many parts not known as standard, and in order to facilitate every opportunity for standardization, have devised a universal numbering system. This is accomplished by using part numbers from 100,000 to 999,999, each division being allotted numbers sufficient to cover a period of thirty-five years. By this method a single part may have but one part number, regardless of how many divisions are using it, and that number indicates the division with which it originated.

Thus, such a part becomes standard and is available at every General Motors service station. Previously each of the company units designed its own parts which possibly differed but very little from those of another unit, but now all of these units use standard parts. This standardization means not only that one factory can supply all the others with a part, but that it will multiply service to the consumer.

The General Motors standard parts group includes

screws, bolts, nuts and similar parts for every possible use on an automobile. Pipe fittings, curtain fasteners, grease cups, ball bearings, nuts, taper pins, rivets, have been standardized, as have the chemical composition and physical properties of the various kinds of metals, together with the heat-treatment required.

Recent developments indicate that concerns outside of the General Motors Corporation are very much interested in this method of standardizing and one concern in particular has suggested that the corporation permit it to adopt the G. M. C. data as printed, inclusive of part numbers and that its sources of supply be allowed the same privilege. Several manufacturers who supply the General Motors with parts have shown their willingness to employ the G. M. C. data as printed, inclusive of part numbers, as also their sources of supply. Thus, it would seem that the system devised by the corporation is fast approaching universal usage. The standard parts today are being utilized by all of the General Motors divisions, which means that approximately sixteen manufacturers are using standard parts under the same part numbers. Therefore, it will become possible, under this system, to advertise the fact that the purchaser of the General Motors Corporation products will obtain universal service on such parts as are listed in the service parts book as having universal numbers. It is a big step toward very desirable standardization.

Special Boring Machine in the Pelton Shop

SPECIAL CORRESPONDENCE

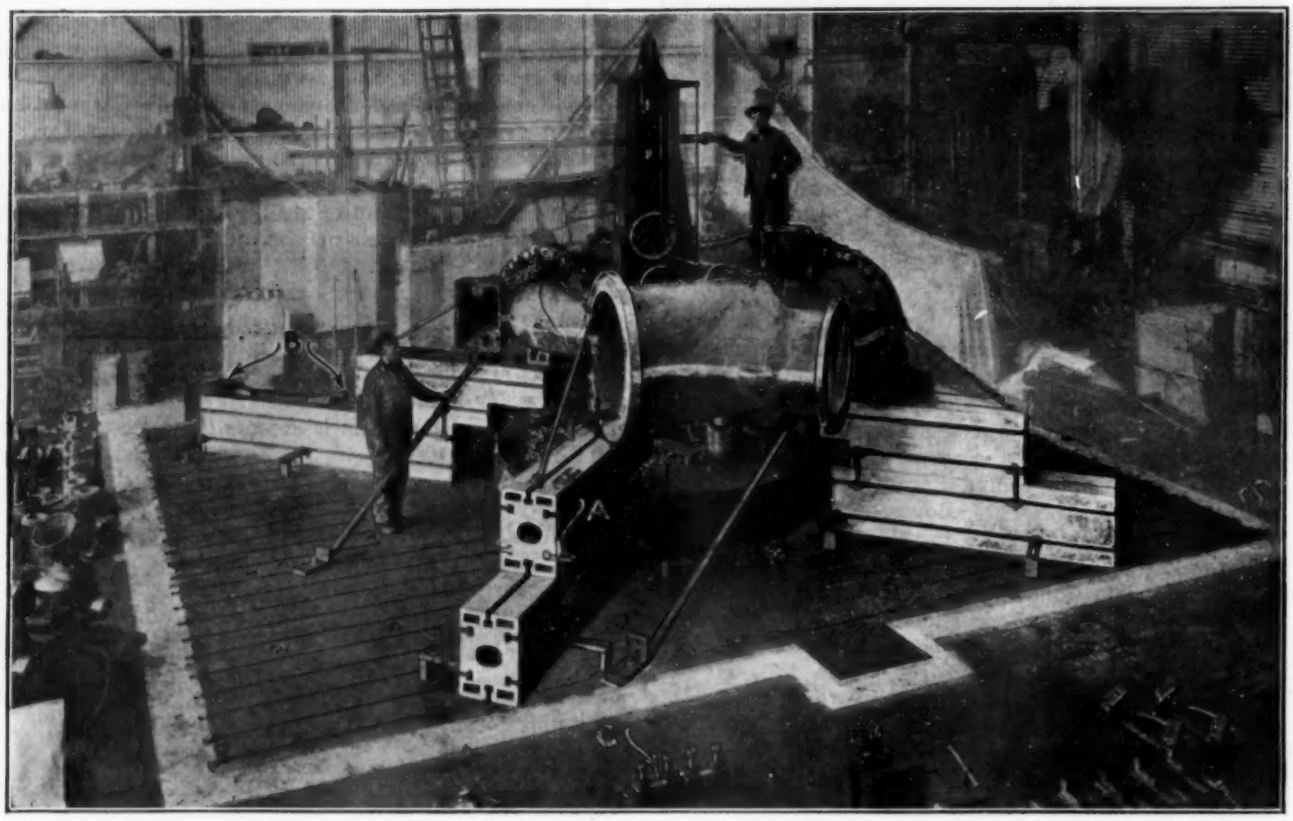
The illustration shows a new floor boring machine of special design, built by the Niles Tool Works, which has recently been installed in the shops of the Pelton Water Wheel Co., San Francisco, Cal. It was built to specifications for the economical machining of large turbines, both the boring and turning being handled in this machine.

The machine properly includes the floor plate of 25 x 30 ft., the long dimension being in the direction of the T-slots. The plate is 12 in. thick and rests on metal shims which are set on 14-in. I-beams, bedded in a solid block of reinforced concrete. The boring table is 10 ft. in diameter and of a substantial thickness to prevent distortion. The distance from the upper side of the table T-slots to the face of the table is $2\frac{1}{2}$ in.

The column shown on the boring table is of heavy and substantial design and can, when mounted as shown, bore a hole 16 ft. in diameter and 7 ft. deep, with an undercut of 15 in. if necessary. The same column can be moved to any desired point of the floor plate and with the work clamped to and revolved by the table, the column can be used for turning and has a large capacity. The tool column is designed to machine faces which are parallel within 0.00025 in. and on diameter the tolerance is 0.0015 in. in the length of the column.

In the job shown the casting weighs 15 tons and has a bore of 66 in. which is the smallest size that can be handled with the tool column shown, but a smaller column is provided for work of less diameter. The boring machine is driven by a two-phase alternating current motor, speed changes being secured by a gear box running in oil.

The parallels shown are 18 x 24 in. in section and of various lengths, as can be seen. They are accurately made, the tolerance of parallelism of opposite faces being 0.002 in. Special T-headed forgings, shown at *A*, are used for bolting the parallels together when used in pairs as shown. The cleats shown at *B* are for lifting with the crane in moving from one point to another on the floor plate and take the place of the lifting pieces, shown at *C*, which were designed for this purpose.



LARGE SPECIAL FLOOR PLATE BORING AND TURNING MACHINE

Machine Shop Practice in Various Western Shops

Making Centrifugal Pump Castings—Some Operations on "Big" Work—How Bottle Molds Are Made—An Interesting Milling Job

BY FRANK A. STANLEY

SOME illustrations are here presented of a variety of work as handled in a number of different shops and foundries on the Pacific Coast.

One line of work carried on in numerous plants of the West is the manufacture of pumps of all kinds,

FIG. 1. A GROUP OF PUMP PATTERNS IN A SACRAMENTO FOUNDRY

particularly for irrigation and mining purposes. Many of these pumps are of the centrifugal type, some driven by direct connected motor, others adapted for belt drive from either motor or gas engine. The halftone, Fig. 1, reproduced from a photograph taken in the foundry of the Henneuse Manufacturing Co., Sacramento, Cal., shows a number of patterns for pump work, among which are included patterns for bases or frames and for casings or bowls. The making of castings for such members forms an important portion of the jobbing work handled in this foundry.

The pump base or bed is molded in a two part flask, one interesting feature being the coring of the small holes through the four lugs at the sides of the work. The core prints for these holes for the holding down bolts are distinctly shown in place on the pattern lugs.

The molding of the casing or bowl involves some very nice core work. The cores are made in halves in a wooden core box which is provided with a sweep on a central spindle for shaping the joint face of the core. For baking core work of all kinds, the cores are placed on metal trucks of which there are several for different sizes of work. These core trucks or cars are operated on rails leading directly into the ovens, which are heated by coke. For the brass department of this foundry oil fuel is used. The oil burner equipment and the air connections are in a pit under the foundry floor where a grating gives access to the apparatus in the pit. The furnaces are bricked in below the floor level and are arranged for ready reception of the crucibles which range up to 150 lb. or more capacity. Air is applied under pressure of 30 to 40 lb. The oil spray and air are controlled by convenient levers projecting upward through the grating. Oil is supplied from a large tank at the side of the foundry wall, the entire installation being not only compact but so arranged that none of the equipment is in the way of general operations carried on around the foundry floor.

The views in Figs. 2 and 3 show some heavy work in the shops of the Union Machine Co., San Francisco. The first of these illustrations represents a very unusual operation, the facing of a large rectangular bedplate on a vertical boring mill. This kind of work would ordinarily be handled on a planer, but in a shop doing a variety of machine work, jobs that come along in a hurry often have to be finished in the machine which is available at the time. This particular casting was required to be surfaced flat and true and the big boring mill was used very effectively on the work. The casting was of such size as to just clear the inner faces of the housings. The method of mounting the work on the table was to place it on a large parallel at the center with heavy parallels under either end and with inter-

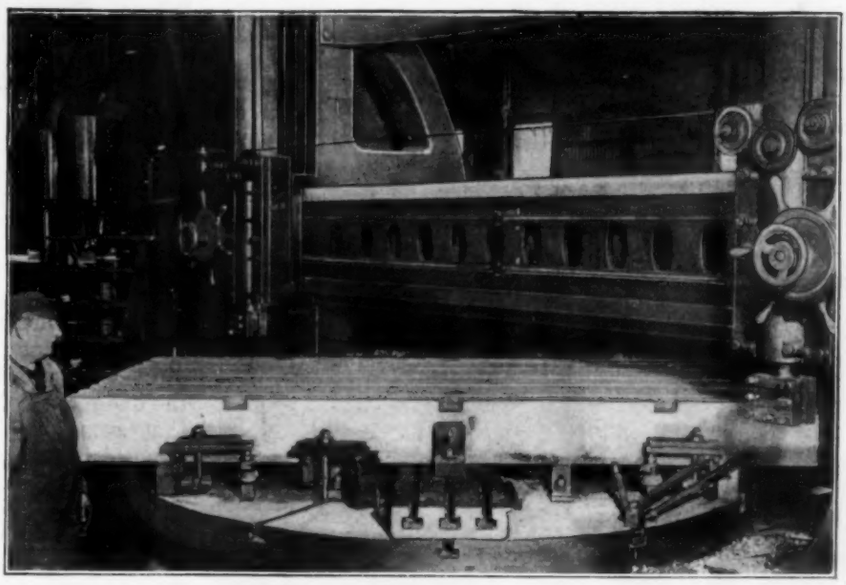


FIG. 2. A BIG BORING MILL JOB

mediate jack blocks between them. For applying the holding down straps, clamps were secured to the side walls of the casting to take the pull of the straps which were supported at the rear ends upon short jacks and

blocks. To brace the work against the side thrust, short struts with adjusting screws at their ends were applied at the corners, as clearly seen upon examination of the right-hand end of Fig. 2.

Another big job in the same shop, as illustrated in

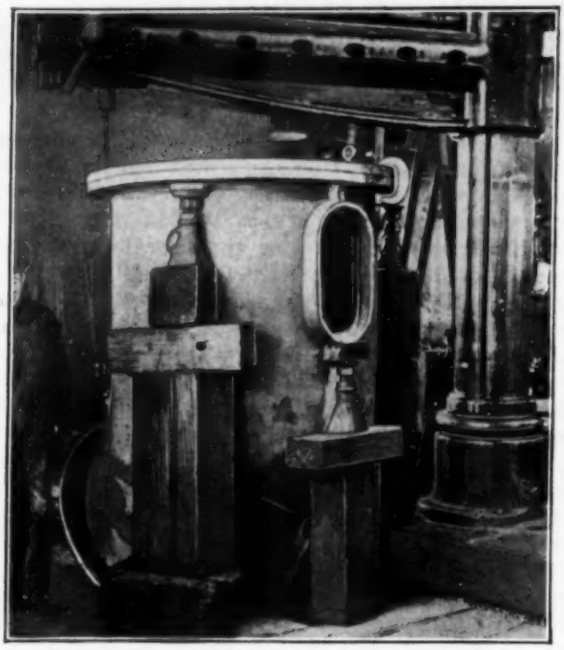


FIG. 3. DRILLING A BIG ELBOW

Fig. 3, consisted of the drilling of the flanges of a big elbow measuring some 4½ft. in diameter by 8 ft. in height. This big casting was handled under a radial drill, and a templet jig was used for locating and drilling the holes. The jig itself was of such size that eye bolts were tapped in at opposite sides for convenience in slinging from the crane hoist for lifting into position at the top of the work. The lower end of this work was dropped into a corner of a floor pit and the main support at the back of the bend secured by jack screws mounted on heavy timber supports. These screws were applied at points under the flanges of the casting to give security and rigid support for the job.

FIG. 4. BOTTLE MOLDS

One of the most interesting features of a glass factory is the making of the molds for bottles and other glassware. Some of these molds, as made and used by the Illinois Pacific Glass Co., San Francisco, are shown in Fig. 4, which is reproduced from a view of one of the benches in this company's mold shop. Such molds are cast in the foundry with chills for cores, to give a hard close grained metal along the inner surfaces which are machined out for the forming of the bottle. The molds are made in halves, and after the milling of the joint faces they are turned on the body to an exact diameter for the reception of the clamp jaws which control their operation in the bottle blowing machine. This finished surface is shown clearly around the closed mold at the right in the photograph.

To finish out the bore to the desired size and form, the two halves of the mold are placed in a holding fixture on the faceplate of a lathe, and a series of tools carried in a special turret are then applied to the boring operations. The action of the tools is controlled by a forming bar at the back of the lathe, which is mounted in place of the regular taper turning attachment. The form in the mold must be very smoothly finished and polished to give the effect of a burnished surface, so that the bottle blown therein will be perfectly smooth at all points around its surface.

Bottles are manufactured in molds of this type in all

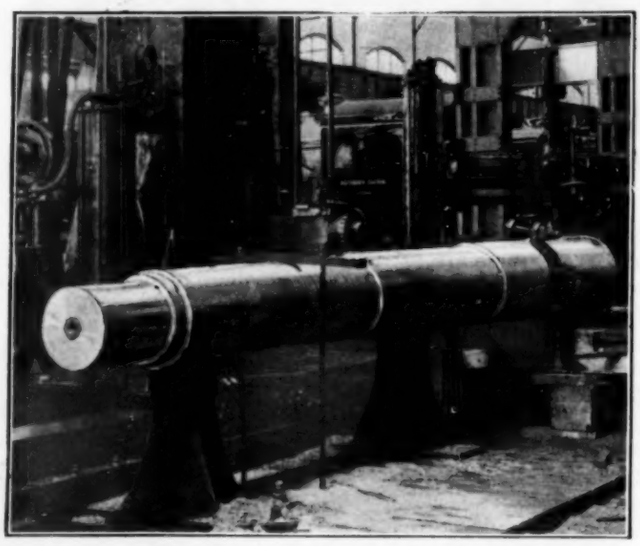


FIG. 5. MILLING KEYWAYS IN A BIG SHAFT

shapes and sizes, so that a great number of molds are required for the varied product of such a plant. The making of these molds requires an extensive force of skilled men and a large number of machine tools of different sizes. Some idea of the extent of the work in the one plant referred to may be gathered from the fact that something like 200 tons of mold castings are handled in this shop annually.

The final illustration, Fig. 5, shows an application of the draw-cut shaper in a railroad shop where heavy marine and other work is handled occasionally. This view is from the Southern Pacific shops at Sacramento. The operation consists in milling key seats in a big shaft where the work is held in heavy V-blocks and clamped down by straps over the top and bolts from the bedplate on the floor. The machine is here shown fitted with a milling cutter on the spindle passing through the ram, the feed for the cut being obtained by traversing the column of the machine along its bed.

The Railroads of Venezuela

Amount of Capitalization—Condition of Rolling Stock—Size of Repair Shops—Extent of Electrification—Value of Machinery Imported from the United States

BY HARRY CHAPIN PLUMMER

MACHINE sale opportunities, equipment and tool conditions in the railway machine shops of Venezuela may be pretty fairly gaged by a consideration of the general mechanical facilities of the several lines, totaling altogether less than 1,000 miles, in their relation to the gross capitalization of the entire system, in which German and English investments predominate, with Venezuelan and French following. A railway in Venezuela, of course, means nothing like the railway systems or individual lines to which we are accustomed in the United States, that is, in point of roadbed and ballasting, locomotives and car equipment and machine shops and other mechanical facilities.

All of the railways of the country represent a total investment of about $39,000,000. To arrive at an idea of original construction costs, the figures for the several major systems are set forth in Table I.

TABLE I. AMOUNT OF CAPITAL INVESTED IN MAJOR SYSTEMS

	Invested Capital		Miles	Cost Per Mile
LaGuaira-Caracas	$3,508,740	English	22.8	$153,892
Caracas-Valencia	15,247,000	German	111.2	137,113
Valencia-Puerto Cabello	3,898,600	English	34.0	114,665
Tucacas-Barquisimeto	5,974,604	English	109.7	54,454
Ferrocarril Central de Venezuela	3,792,450	English	34.8	108,978
Ferracarril de Carenero	772,000	French	33.8	22,840

Not only do construction figures differ widely as between individual railway lines, but they differ materially within the compass of a single line, depending, of course, upon the degree to which each has been built to pass over or through mountain ranges.

The gages and weights of rails used by the several railways of the country are given in Table II.

TABLE II. GAGES OF RAILROADS AND WEIGHT OF RAILS

	Ft.	Lb. per ft.		Ft.	Lb. per ft.
Caracas-LaGuaira	3.0	21.66	Tucacas-Barquisimeto	2.0	16.34
Caracas-Valencia	3.5	15.60	Ferrocarril-Central de V.	3.5	18.83
Valencia-Puerto Cabello	3.5	18.34	Ferrocarril de Carenero	3.0	13.44

Upon all of the railways of the republic the system of traction employed is that of simple adherence. No cog systems are used except on a small stretch of four kilometers, more or less, on the Ferrocarril Valencia-Puerto Cabello, where there is an inclined plane of 6½ per cent mean gradient and 8 per cent maximum gradient, which is provided with cog rails of the Abt principle, to accomplish the unusually sharp declivity. The ordinary rails on the Valencia-Puerto Cabello road weigh 18.34 lb. on the inclined plane. This is the maximum weight of rails in Venezuela, with the exception of the type used on the electric tramways of Caracas (operated by a British corporation), the weight of which is 29.92 lb. per linear foot on the straight lines and 36.55 lb. on the curves. Although there is a gradient of 5.27 per cent on a spur of the Ferracarril Bolivar (Tucacas to Barquisimeto), no cog system is used.

Locomotive and general rolling stock on all of the railways of the country are of much lighter construction than those on the American railway systems and lighter even than those used on almost any line in this country devoted to regular passenger service. They more nearly correspond to the sort of equipment employed on narrow gage roads, such as the Boston, Revere Beach & Lynn Railroad and upon mining and industrial switching spurs in less populous regions of our land. The locomotive operating on the longest Venezuelan railway, as also the passenger and freight-cars, most clearly resemble the equipment that was in use on the old elevated railways in New York and Chicago before the conversion of those lines from steam to electric motive power.

The engines are kept cleaned and conditioned in the shops and yards of the more important lines, and while the "waggons" show the long service to which they were subjected during the war, when not only replacement, but adequate repair was rendered exceedingly difficult by lack of primary materials and essentials, they would pass inspection on a Northern second-class line in point of whole condition and safety and hygienic standards.

There are but few classes of special freight car equipment, which is divided principally into box cars and flat cars. Although producing cattle and oil, Venezuela has on her railways no specific cattle-carrying or oil-tank cars, such as we know on home railroads, and because of the absolute dearth of refrigerator service, the larger centers of population on the highland, scarcely a two-hour run from tidewater, are denied fresh fish, in which the waters of the nearby Carribbean abound, and are greatly restricted in their sources of fresh meats, vegetables and fruits.

The passenger cars are not only small, but they are antiquated. Hand-cars for labor gangs and the crudest sort of wrecking equipment complete the rolling stock on the larger lines.

Naturally, the railway machine shops are maintained on a scale commensurate with so restricted a policy of equipment operation and maintenance. Because of the cheapness (withal the mechanical efficiency) of labor, many tasks that in home railway shops would be accomplished by machinery or with the aid of electric tools, are performed by hand—but performed with surprising accuracy.

Caracas, the most important terminus of three lines —the Caracas-Valencia Railway (Gran Ferrocarril), the LaGuaira-Caracas Railway and the Ferrocarril Central—is the seat of the larger machine shops. The first two lines contrive to share a single small plant at the adjacent terminals of both. At Valencia, on the first-named road, and at La Guaira, on the second-named, there are shops quite as well equipped as those at the capital city, and at both Valencia and Puerto Cabello the English road operating between the highland industrial center and the seaport has shops and mechanical staffs.

There is no doubt that a drive studiously and consistently undertaken by any well-organized and well maintained railway machinery interest in the United States upon the several principal railway enterprises in Venezuela, for the purpose of introducing more modern apparatus and devices in the mechanical departments of those railways, would stand every chance of success.

Like all public utilities whose operations are conducted without the country wherein their directorate

and stockholders have their seat, the Venezuelan roads are governed by a much more conservative, if not reactionary, policy than are home carriers whose executives are in immediate touch with the area of operation. Despite this fact, however, one of the leading American electrical manufacturing corporations succeeded not long ago in convincing the directors in London of two railways long established in Venezuela—the line between Macuto, La Guaira and Maiquetia and that between Caracas and Petare (the latter now a subsidiary of the Ferrocarril Central) that electrical installation and operation would save them money and would net them greater earnings, with the result that it secured the contract for installation and all supplies and accessories over competing electrical interests in London and elsewhere in England.

Electrification Being Favored

The director of the Gran Ferrocarril de Venezuela was less successful, two years ago, in urging upon his home directorate at Berlin the advisability, indeed the necessity, of converting the 16.8 mile "commutation stretch" of that line between Caracas and Los Teques from steam to electric power. The greatly reduced position of the mark and attendant financial and economic conditions in the Fatherland at the time were such that his appeal went unheeded. This improvement will be effected, however, within the coming year, according to the best posted opinion in railroad and government circles in Venezuela; but it is a safe venture that when the time comes, German electrical interests will secure the contract for the electrification of the line and the installation of all electric apparatus and equipment.

Yet another notable instance of physical improvement was that begun three or four years ago on the La Guaira-Caracas railway and the examples subsequently followed by the corporation of the port of La Guaira, which maintains a small switching line, of exceedingly heavy traffic, the Ferrocarril Bolivar and a small railway terminating at La Ceiba in the State of Zulia, of which Maracaibo is the capital. This improvement consisted of the conversion of locomotives and other items of the entire road equipment to provide for the consumption of crude petroleum instead of Cardiff coal briquettes in use elsewhere upon the Venezuelan railways.

Not only upon the railways and in every mechanical department incidental thereto, but in every industry in Venezuela, fuel saving and conservation has become an imperative need of the hour. In the present stage of exploitation and development of the Venezuelan petroleum fields crude oil has become an expensive item and its physical condition, even when refined in the neighboring Dutch island colony of Curacao, is such that it does not produce all of the results hoped for in the larger industrial plants, although the boiler-room equipment of many of these of late has been converted into oil-burners. By denudation, vast areas of forest have been exhausted of fuel wood, and the government has placed severe restrictions upon the further employment of even the commonest woods. While an industrial bituminous, of lignite characteristic, has been recovered in the east of the republic, near the Orinoco Delta, as, also, in the western state of Falcon, this has not yet been developed to a stage where it serves ideal purposes for fuel use. Considerable English and American coal continues to be imported by the major plants.

Locomotives and rolling stock on the principal Venezuelan railways imported from England and Germany many years ago, have not been replaced to date. General machinery imports from the United States totaling, in 1920, $1,259,227 in which were included materials brought in for railway machine shop use, comprised the following specific items:

	1920	1919	1918
Air-compressing machinery	$1,832	$3,900	$1,164
Electric locomotives	.....	3,400	.....
Stationary gas engines	4,690	2,320	1,693
Gasoline traction engines	57,543	26,149	.....
Kerosene engines	11,490	250	203
Steam traction engines	5,827	3,200	.....
All other engines	15,719	1,400	1,377
Boilers	98,403	5,216	23,123
All other parts of engines	50,843	32,214	20,897
Lathes	11,352	11,351	795
Other machine tools	9,849	6,846	4,472
Sharpening and grinding machines	7,647	396	357
All other metal-working machinery	22,027	4,215	14,925
All other machinery and parts	358,574	187,426	156,695

Big Shops Versus Little Shops

By R. F. Moore

In looking over the article under the above heading, published on page 99 of the American Machinist, I note that W. D. Forbes desires the opinion of mechanics as to how they would go about the job described.

The job is a very simple one, but if I had it to do I should first ask: *How* evenly spaced must the ten holes be, and how concentric with the centerhole? Mr. Forbes gives very liberal limits on all other dimensions, but on the seemingly most important ones the limits are not given. "Evenly spaced" is the term he uses: does this mean within 0.001, 0.0005, or 0.0001 in.; or does it mean 0.005 in.?

We will assume that the holes are to be within 0.001 in. The method he describes will not bring them within this limit. In the first place he should have used a combination center drill in the milling machine to start the drills, as every mechanic knows that a twist drill will not start accurately in line with a spindle without a spot for it to start in. Even so I doubt if the holes would come within the 0.001 in. limit.

So the question arises "how will we do the job?" These ¼-in. holes are pretty small to be bored and reamed; nevertheless it could be done, and I should say that by this means they would come within one, or even one-half thousandth, providing the dividing head was accurate. This, however, would consume more than three hours time.

Perhaps this is the reason the $40 shop would not be responsible for the job and seemed to charge such an exorbitant price, and perhaps the small shop "took a chance" and luckily the job was satisfactory.

I would like to hear more on this large and small shop question.

Cutting the Production Cost of a Difficult Part

Balancing Pressure of Cuts by Simultaneous Cutting of Opposed Tools—Two, and Sometimes Three, Tools Cutting at Once—The Fay Lathe Machines Its Own Parts

By H. A. LOUDON

THE line drawing, Fig. 1, shows a part of the standard Fay lathe that because of its shape, the amount of metal to be removed and the close requirements in the matter of finish and tolerances, proved a difficult proposition to handle in any way other than

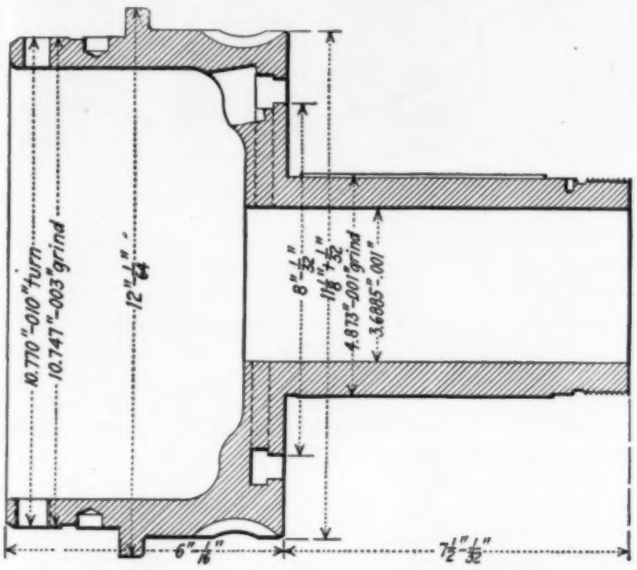


FIG. 1. THE CAM DRUM WORM FOR THE FAY LATHE

by holding on a mandrel between centers; and that method took altogether too much time.

It was desirable to complete as much of the outer surface as was possible in the same setting in which the bore was finished, and to do it with standard equipment so far as that could be accomplished; but the overhang was so great when the piece was held in a chuck, that long and consequently springy tools were necessary to reach the shoulder where the heaviest cuts were to be taken. Therefore, a compromise was effected by designing the special toolblock, shown in Fig. 2, for a Hartness flat turret lathe. There are many places where this can be done to advantage and these tool blocks have possibilities which have been overlooked in too many cases. A special tool block of this kind will frequently make a decided saving in machining time as in this case.

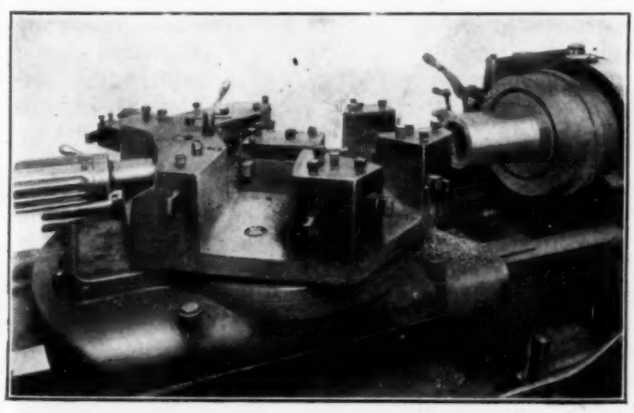


FIG. 2. FIRST SET-UP ON FLAT TURRET LATHE

The openings between the bosses for holding the tools in this block permit the turret slide to be run under the work, the long hub on the latter projecting between the outer bosses, thus supporting the facing and slotting tools practically without overhang, while tools for facing and chamfering the end of the hub are rigidly held in the central boss, also close to the work.

Besides providing a more efficient means of holding the tools and better distribution of the cutting strain, this special block can be removed from the turret without disturbing the set up, and may be put away in the toolcrib until the next batch of work requires its use. It is held to the turret by six cap screws and its complete removal takes less time than would be needed to take out the tools separately.

Ordinary means of holding the work by chucking from the inside of the large end proved insufficient to withstand the pressure of the heavy cuts, and therefore

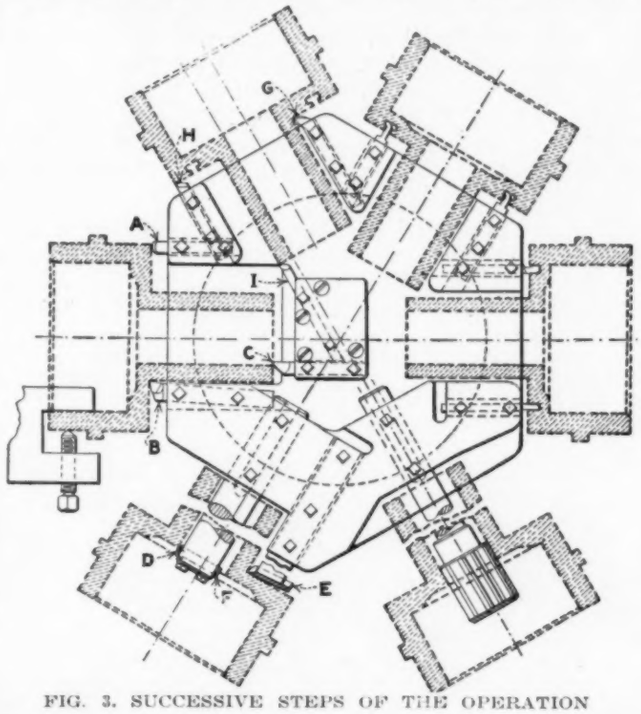
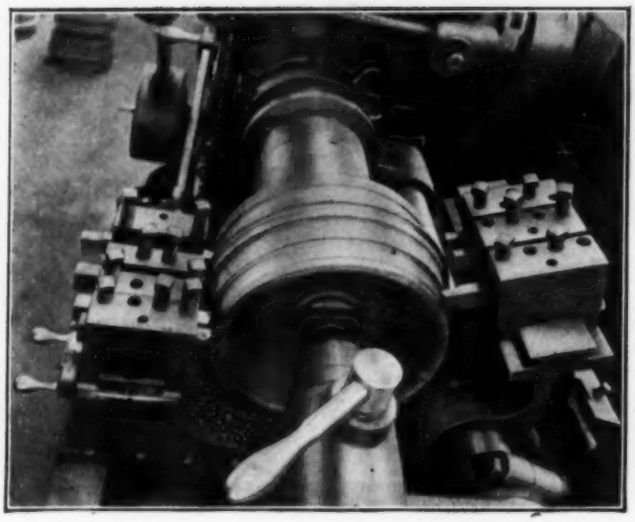
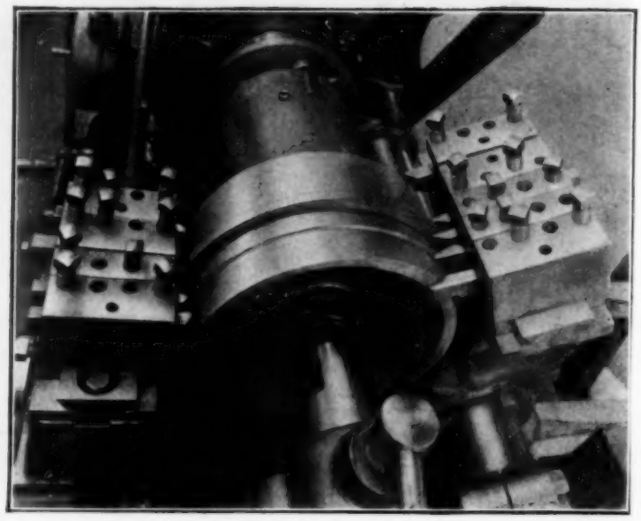


FIG. 3. SUCCESSIVE STEPS OF THE OPERATION

the chuck shown on the machine in Fig. 2 was used. This is an "inside" chuck with a lip on the outer end of each jaw through which passes a setscrew bearing upon the work. Thus a grip is provided at each jam, both on the inside and on the outside of the piece, holding it securely.

In Fig. 3 the tooling for all six positions is shown graphically. In the first position, tools *A* and *B* divide the facing cut between them, while at the same time tool *C* faces the end of the hub. Tool *A* is right side up while *B*, cutting behind the center line, is upside down; thus the cutting pressure is practically balanced. The lathe runs for this operation 20 r.p.m. with a feed of





FIGS. 4 AND 5. ROUGHING AND FINISHING IN THE FAY LATHE

1 in. in 40 turns. This is governed, of course, to suit the outer tools, while the cut at *C*, though performed at less than normal cutting speed, is clear gain. The cutting time is 2 min. 45 seconds.

In the second position, tool *D* rough-bores the hole at the same time that tool *E* turns the outside of the hub, *D* being inverted and thus balancing the pressure of the cut. Upon completion of this cut the cross-sliding head is moved back against a set stop in position for the finishing cut with tool *F*. Roughing time is 6 min. 45 sec. at a speed of 36 r.p.m. and a feed of 1 in. in 40 turns. This ratio is not changed for the finishing cut, but the speed is raised to 88 r.p.m. and the time is thus reduced to 3 min. 10 seconds.

The third position of the turret is used only for reaming, the slide being moved forward by hand and the rotative speed reduced to 13 r.p.m. Time for this operation is 30 sec. As the hole in the fixture is bored after the fixture is in place on the machine accurate alignment is assured.

The next operation is cutting the narrow annular groove that later becomes a T-slot. As will be noted in position No. 4 two tools work together upon opposite sides of the center, thus balancing the pressure. Because of the construction of the fixture, allowing the projecting hub to pass between the bosses, the tools are supported close to their cutting edges, eliminating vibration. This groove is $\frac{11}{32}$ in. wide by $\frac{11}{16}$ in. deep and is cut in 3 min. at a rotative speed of 17 r.p.m. and a power feed of 1 in. in 71 turns.

In position No. 5 the same principle of applying two tools is used to undercut the slot, one tool being inverted and working back of the center. The cross-slide is clamped after bringing the tools to position and the undercut made, both sides, at one movement by the cross movement of the head; time, 1 min. 15 sec., at a speed of 13 revolutions per minute.

In the sixth position, tools *G* and *H* again divide the facing operation between them; finish facing the shoulder in 2 min. 45 sec., while at the same time tool *I* finishes the end of the hub. This completes the sequence of movements in a trifle over 20 min. on a job that formerly required well over an hour.

Turning the outer contour of the piece at the large end is done on centers, using two Fay lathes one of which is set up for the roughing cuts and the other for finishing. There are no special features in this set-up except those ordinarily used on such machines. The roughing tools are shown in Fig. 4 and the set-up of the finishing lathe in Fig. 5. By careful attention to the placing of the tools, however, the time required for the roughing is but 4½ min. while the finishing operation takes even less, one operator attending both machines.

The piece is now returned to the flat turret lathe where it is held upon a plug arbor while the outer end

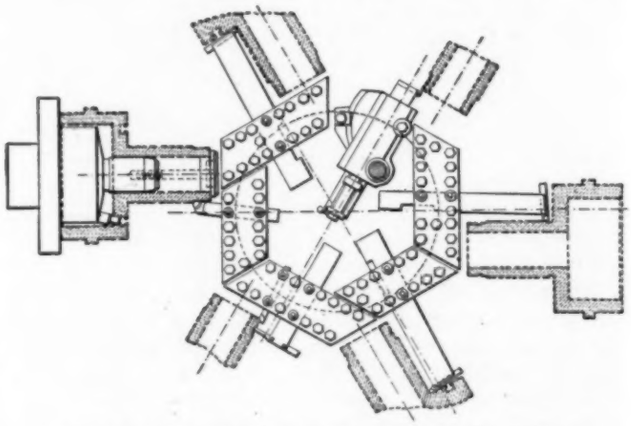


FIG. 6. TOOL LAYOUT FOR FINAL OPERATION

of the hub is reduced in diameter, necked and threaded; an undercut is made for wheel clearance in the grinding operation which follows. The tool set-up is shown in Fig. 6, position No. 5 being the Hartness attachment for cutting the thread. Position No. 6 shows a tool for cutting an oil groove, which is done by holding the work stationary while the turret slide is moved back and forth by hand. While the actual cutting time for this latter operation cannot be expected to compete with a shaper, or oil grooving machine, it saves all of the time that would be required to set up and dismount the work.

The piece under consideration is the cam drum worm of the Fay lathe, and while no especial outlay beyond some hard thinking was required for the tooling, the saving in production cost amounted to one dollar per piece. It is this kind of thinking which it pays any shop to encourage in any way which will secure the desired results. This is where real saving can be made in the cost of production.

Electric Drive for Reversing Machine Tools

Reversing Mechanisms—Dynamic Braking and "Plugging"—Power Consumed in Reversing—Effect of Reversing on Production—Variation in Power Requirements—Torque

By A. L. HARVEY
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MANY of the machine tools in common use are of such a nature as to require operation in both directions. This may be accomplished by crossed belts, clutches or reversing electric motors. When driven through belts or clutches there is a loss of power through slippage, and a loss of the cost of the maintenance of belts or clutch shoes. Of the various machines, and parts of machines, included in the classification of reversing applications may be mentioned: (1) Standard reversing planers; (2) plate planers; (3) tapping machines; (4) lathes; (5) grinding machine tables; (6) carriages; (7) cross-rails and toolheads; (8) traverse motion. In addition to these are other machines that can usually be classed in one of the above general groups. Thus, as far as the control equipment is affected, draw cut shapers, gear shapers and large key seaters come in the same class as planers. Such machines as crank shapers, while having a reciprocating motion are usually provided with non-reversing electrical equipment.

Calculation of Starting and Stopping Force

To start any machine power is required. This power must be supplied by the source of energy. Also, to stop the machine power is required, but in this case the stored energy in the moving parts of the machine may be utilized by means of dynamic braking if a direct current motor is used. All of the various moving parts such as gears, pulleys, shafts, motor armature and the work (in case of a lathe and planer) make up the elements that have to be considered in designing the machine and its drive, to make it suitable for reversing electric service. (This also applies to non-reversing machinery that must be started and stopped frequently, such as punches and shears). The amount of energy in any part is $\frac{1}{2}mv^2$. From this it can be seen that speed is a very important consideration, as the energy varies as the square of the speed. When weight (in pounds) is used in the above formula instead of mass, it becomes

$$\text{Energy} = \frac{W}{64.3} V^2,$$

where W is the weight and V is velocity in feet per second. For rotating parts of the machine, the energy must be based on that velocity that would store the same energy for the same weight moving in a straight line. The velocity at the center of a rotating element of a machine is zero, and is a maximum on its circumference. The radius at which the velocity is the same, with respect to energy, is that at which the weight may be assumed to be concentrated, and is called the radius of gyration. For different shaped parts, the radii of gyration can be obtained from text books on mechanics, and from mechanical handbooks. For convenience, some shapes are given in Table I.

TABLE I. RADII OF GYRATION

*Gear spoke—axis at end	$R = 0.5773$	l
*Gear spoke—axis at mid-length	$R = 0.2886$	l
Shaft or solid gear	$R = 0.7071$	r
Pulley rim	$R = 0.7071$	$\sqrt{r_1^2 + r_2^2}$

* For uniform section.
In the above l is the length; r, r_1 and r_2 the radii.

The substitution of radius of gyration and revolutions per second for velocity will change the energy formula to $\text{Energy} = \frac{WR^2(2\pi \times s)^2}{64.3}$, which may be reduced to $E = \frac{WR^2S^2}{1.63}$, where S is revolutions per second, R the radius of gyration and W the weight in pounds.

Stored Energy as an Element

In many cases, where a high-speed machine is used, the amount of stored energy to be started and stopped is a large factor in considering the size and type of motor and control equipment to be used. When the electrical manufacturer recommends the proper equipment for a given machine, the cycle of operation and kind of work performed is usually considered complete data. However, in such a case as we are now considering, the energy in moving parts may be a very large factor in the operation of the total equipment.

The more stored energy there is in a machine, the larger will be the power requirements for acceleration. If the power peaks are limited in value, the time of acceleration will be longer. Also, the time to stop a machine, assuming the value of braking force to be the average for the size of motor used, will be longer than in the case of a machine having less stored energy. In reciprocating machines, where the design of parts is such that the travel must be limited on account of clearances at the end of the strokes, it is important that the stored energy be kept down to prevent possible jamming of the moving parts with the parts that limit the travel. In standard planers, the shifting mechanism is such that it clears other parts after operating, and the table or platen can move any distance necessary to bring it to a stop. If planing up to a rib or shoulder, it is necessary that the stop be accurate so that the stroke will be completed without running into the projecting parts of the casting. The amount of variation is very small on slow speeds and may be slightly larger when on the higher speeds, due to the larger amount of stored energy and variation in friction.

That a machine will operate satisfactorily at a certain speed is not an indication that it will do so at higher speeds. An easy way to show what happens is to measure the distance required to stop a planer platen, from the time the shifting mechanism operates until the platen comes to rest. This should be done on the slowest cut speed and the highest return speed, to get the greatest variation in stored energy. On a planer geared for 25 ft. per minute slow cut to 100 ft. per minute fast return, the speed ratio is 1 to 4 and the stored energy 1 to 16. Neglecting the retarding effect of friction, the platen will move 16 times as far on high speed after the shifting mechanism has been operated, as it will move on slow speed, if no braking force were provided.

Effect of Reverse Speed on Production

A check on the effect of speed of a reversing machine on production can very readily be obtained in most shops on a reversing planer when working on short stroke.

On approximately 24-in. stroke and less, more strokes per minute will be obtained when working the machine at the slower speeds. On one particular planer with a 20-hp. motor, 12 per cent increase in production was possible on the slowest motor speeds, compared to the highest speeds, when working on a 20-in. cut.

The method of gearing the motor to the machine, and also the motor speed, may have a considerable effect on the operation. On a certain machine having a 50-hp., 750-r.p.m. motor geared to a shaft running 375 r.p.m. the stored energy of motor and gears was

Motor armature	14,800 ft.lb.
Motor pinion	1,640 ft.lb.
Gear on shaft	3,821 ft.lb.
Total drive energy	20,261 ft.lb.

By using a 375-r.p.m. motor, the stored energy of the gear and pinion are eliminated and the slower speed motor will have a stored energy of 6,830 ft.lb. There will be a coupling required between motor and shaft which will have approximately 1,200 ft.lb. stored energy for a flanged coupling, and approximately 800 ft.lb. for a sleeve type coupling. Using the flanged coupling, the total energy up to the shaft is 8,030 ft.lb. or 12,231 ft.lb. less than is obtained in the drive actually furnished. With a different bedplate, the motor could be geared direct to the machine shaft, eliminating the coupling and making a better mechanical arrangement.

The cost of the motor will be greater, due to its slower speed. The cost of the gear and pinion and one bearing will partly offset this. Also, there will be a saving in power due to having slower moving parts to accelerate, and the saving of gear losses. In addition there is a time saving due to the shorter time required to accelerate, stop and reverse the moving parts.

Acceleration of the parts of a machine requires a force sufficient to overcome the friction and to impart energy to the moving parts. If the force is only slightly larger than that required to overcome friction, the time of acceleration will be long. If the force is increased, the acceleration will be more rapid and the time decreased accordingly. The work of acceleration for uniform acceleration in foot pounds is

$$f\,t = \frac{1}{2}\frac{w}{g}v^2$$

where f is the force, t is time in seconds, w is weight in pounds and v is the final velocity. To this must be added the force to overcome friction. Where rotating parts are considered, the velocity is to be taken at the radius of gyration.

To stop the moving machine, the same amount of work is required as in acceleration. Friction helps stop the machine, so with the braking force equal to the accelerating force, the time of stopping will be less than the time of starting.

Power Loss in Mechanical Drives

In mechanical drives, such as by belts or clutches, there is no convenient way to measure the power requirements, except indirectly by maintenance costs, and by time lost while making repairs. This, while it does not give any engineering data, plainly indicates that there is a power loss in the transmitting devices. With electric drive, direct mechanical connections can be made, and meters can very readily be put in the circuit to indicate or record the power requirements of the machine.

During acceleration, the current of the motor increases as each step of the resistor is short circuited, and decreases as the motor speed increases. Part of the energy drawn from the line is dissipated in the form of heat in the starting resistor, and the balance is performing useful work of acceleration. The usual practice is to consider the useful power half of that drawn from the line. The average power must be found, which can quite readily be done if a graphic meter with proper paper speed for test purposes is available. During dynamic braking, all the power generated by the motor is dissipated in the form of heat in the braking resistor. As the speed decreases, the braking torque will be decreased, and the graphic meter can again be used to obtain the average value of the braking force. The greatest braking force is available when the speed is high and when the stored energy is the highest. As the speed decreases the stored energy decreases as the square of the speed, and thus the braking current is not decreasing as fast as the stored energy.

Having calculated the stored energy and the accelerating and braking forces, or obtained them by test, the time to start or stop the machine is

$$t = \frac{\text{Energy}}{HP \times 550},$$

where t is time in seconds, energy is expressed in foot pounds and the horsepower is the average during starting and stopping. This expression neglects friction. Also a uniform rate of acceleration or deceleration is assumed. Where a stop must be made in a specified distance, we can assume the average speed during braking will be ½ of the normal speed. We can then take the time to stop as equal to the time required to run twice the distance at normal speed. Then the braking force is to be made such as to obtain the required stop, and this is found from transposition of the factors in the last formula, which now becomes

$$HP = \frac{\text{Energy}}{t \times 550}$$

These calculations must be applied with judgment, as they do not take into consideration the strength of the machine parts or the commutating limits of the motor.

Mechanical Requirements of Motor

The mechanical requirements of the motor, besides having a low moment of inertia, call for a strong frame, shaft and bearings, in order to stand the reversals of the armature at frequent intervals. A substantial foundation or base is necessary in order to prevent the gears getting out of line when the motor is connected to the machine by gears. The motor brushes, commutator and armature winding must be sufficiently liberal in design to stand the additional heating due to accelerating and braking peaks of current during the most frequent cycle of operation.

The controller, of course, is necessarily of the contactor type, which is more substantial and requires less maintenance than any other type now available. There are two methods of stopping the motor at the end of each stroke, viz: dynamic braking, and plugging.

Dynamic braking is the method of stopping the motor by the generation of power, using the stored energy as the motive power, and dissipating the electric power in the dynamic braking resistor as heat. Plugging draws power from the supply line to stop the motor, and consequently the power cost per unit of output is greater. On a machine operating on a short stroke, such as a gear shaper or keyseater, the difference in power requirements will be considerable. There will

also be increased wear in the commutator and brushes when a plugging type of controller is used. There will also be a more abrupt stop, as when the motor slows down, more current will flow through the armature, due to lower counter electromotive force. As the motor slows down the stored energy is rapidly reduced and the torque increases, due to the increased current. The result may, in some cases, be such a rapid change in speed as to cause high maintenance of the machine parts.

The rate of acceleration on practically all machines of the reversing type must be sufficiently high to obtain full speed before the tool enters the work, and still have only a short overtravel. With a lower rate of acceleration a longer travel is required to give sufficient time to accelerate the motor and machine, which results in less production.

The contactors on the control panel are controlled by a master switch which is operated mechanically by a shifting mechanism on the machine. This mechanism must operate positively, so as to be sure of the proper motion being transmitted to the master switch. When used on a machine driven by an adjustable speed motor, the master switch must be operated satisfactorily at the slowest speed, and it must not be operated violently at the highest speed. The mechanism should also be designed so that after imparting the necessary motion to the master switch, no further motion will be transmitted to the master switch by the overtravel of the machine. Where this is not feasible, sufficient clearance must be provided so that there is no danger of jamming any of the moving parts. It is preferable that the tripping dogs be the only moving part after the master switch has operated. This condition is obtained in the reversing planer, which is very necessary, as it readily allows the platen to be run out to the end of the bed to remove and set up work.

Use of Limit Switches

It is desirable to furnish limit switches on some machines in addition to the master switch, in order that a failure of the shifting mechanism will not permit jamming a machine (such as running a plate planer carriage into the frame at the end of the ways) or to prevent a careless operator from running a planer platen off the bed when running the platen to the end of the bed, at which time the master switch may not be operable by the shifting mechanism due to the position of the dogs.

When it is necessary to use an alternating current motor, a special study of each case is required in order to select the correct equipment. The characteristics of alternating-current motors make them less suitable for reversing applications than direct-current motors. The starting torque is lower; the starting current is much higher; and dynamic braking is not obtainable without complicated equipment, including a source of direct-current for use in the motor windings during the braking period. The low starting torque necessitates a larger motor frame in order to obtain a reasonable rate of acceleration. The high starting current limits the frequency of operation due to the heating of the windings. As dynamic braking is not usually feasible, a plugging controller is necessary.

A careful consideration of the various details with respect to their effect on the operation on the machine and its rate of production will result in a more efficient tool, more satisfactory electrical equipment and higher production. This is especially important in the case of the older tools that are changed over to electric drive by the user.

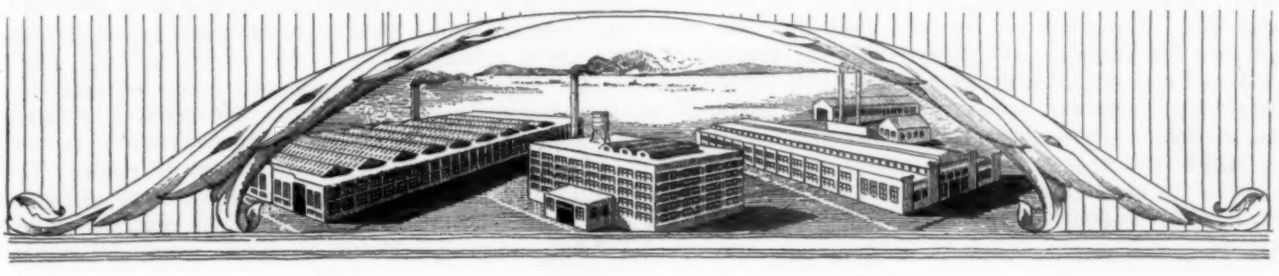
Using Trade Magazines to Capacity

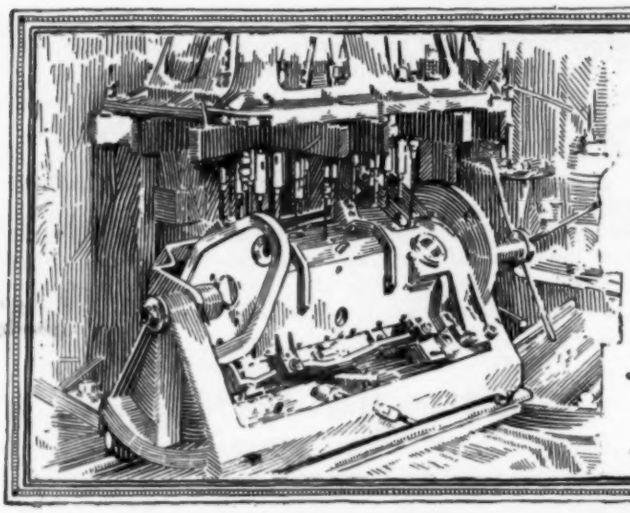
By Frank Szabo

The articles dealing with the use of trade magazines, which have appeared in American Machinist recently, are very interesting so far as they go. But why stop at the end of a list of executives who are to read the technical magazines? Why not be generous enough to give subordinates interested in technical subjects a chance to make use of these ideas? The magazines offer many good and worth-while suggestions which are of no interest to executives, but would be very helpful to tracers, detailers, machinists and electricians. Even though the suggestions are of no immediate use, they may be jotted down in a note book for future reference.

I remember an instance where technical magazines after making the rounds of executives, were torn apart and articles indicated for reference were marked, indexed and cross-indexed, while the balance was thrown away. But only a few remembered, when in need of information, that such a thing as a clipping file existed. Then one day, when a change in the office arrangement made it necessary to acquire additional space, the clipping file was discarded, together with a large number of unfiled magazines. Thus many articles valuable to a draftsman or machinist went to the paper baler. Among the articles that were not filed, because they did not interest executives, were series entitled: "Engineer's Study Course," "Principles of Magnetism and Electricity," "Electrical Study Course," from *Power;* and "Cam Design" in the American Machinist, and many others. How much these articles would have helped the ordinary employee seeking enlightenment on such subjects, I leave the reader to imagine.

Many of the articles that interest executives today are stale and of no use whatever in a very few years from now, for systems and methods seem to change as fast as fashions. But the simple drafting room or machine-shop kink printed in these magazines may be as helpful in ten or twenty years as it is today. Therefore, I suggest again, give subordinates a chance to receive some of the benefits derived from technical magazines.





Tool Engineering

By
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Dowd Engineering Company, New York City

Design of Reamers—Types of Plain and Solid Reamers—Core Drills and Rose Reamers—Expansion and Inserted-Blade Adjustable Reamers

REAMERS of various kinds are used for sizing holes, generally after a boring or drilling operation. The form of reamer used depends on the kind of work and to some extent on the material being cut. The cutting action of a plain reamer occurs at the end only, although there is doubtless a slight scraping action along the flutes. On certain kinds of work provision must be made to counteract this latter effect, as in the case of work which is very thin, where the weight of the reamer in the hole might cause it to cut and enlarge the diameter slightly.

A reamer must be considered not as a generating but as a sizing tool, and the accuracy obtained by its use is dependent upon a number of factors. The design of the reamer is influenced by the size of the hole, the material to be cut and the general conditions connected with the holding and driving of the reamer itself.

The following points are of importance in connection with reamer design:

(1) The diameter of the hole to be reamed has an effect on the design. For a small hole it may be necessary to make a solid reamer, while for a larger hole blades inserted in a body can be used and suitable adjustments provided. The size of the hole controls the number of flutes in the reamer, or the number of inserted blades which are used. The length of the hole which is to be reamed is likely also to affect the design of the reamer to some extent. A reamer used for a long hole may require a pilot, while a short hole can be reamed by means of a plain reamer without a pilot.

(2) The material to be cut affects the design, both as to the number of flutes in the reamer, the angle of the cutting edge, its relief, back taper and the method of support. A reamer may be straight or tapered; it may have straight or spiral flutes; the teeth may be equally or unequally spaced, according to the material being cut. The teeth on reamers used for steel and cast iron are generally on center, while for brass they are sometimes cut slightly ahead of center. Occasionally square reamers or scrapers are used for fine finishing, particularly when the material is brass. In reaming babbitt metal, the end of the reamer is often ground tapering for about ½ in., the taper starting at the diameter of the hole generated by the boring tool. By using this method a smooth hole free from lines and rings can be made. In order to avoid chatter, left-hand helical fluting is recommended.

(3) The reaming allowance, or the size of the hole into which the reamer enters, is quite important. In certain kinds of materials such as brass and malleable iron, a reamer should have more stock to remove than in steel and cast iron. Unless a sufficient amount is left for the reamer to remove the cutting action is not good, and after the hole has been finished it will shrink and be undersized. When using only one sizing reamer for steel or cast iron, the amount of metal removed varies from 0.005 to 0.015 in., depending somewhat on the diameter.

It must be remembered that the size of the hole in production work depends for its accuracy to a great extent on the finishing reamer having the same amount of stock to remove in each case. Hence, boring tools or other cutting tools used prior to the reamer must be so made that they will leave the hole the same diameter.

A roughing reamer should always be preceded by a single-point boring tool or its equivalent, in order to generate a true hole. On very accurate work, both roughing and finishing reamers can be used. When they pass entirely through the work, it is possible to place both reamers on one bar, although the first reamer should be entirely through cutting before the second one enters the hole.

(4) For convenience in calipering, reamers are usually made with an equal number of teeth. These teeth are spaced an unequal number of degrees apart in order to prevent "chatter." This is a very important matter, as only once in each revolution are all the teeth in duplicate positions. Reamers are often made with left-hand helical flutes, which construction prevents chatter to a certain extent, and at the same time prevents drawing in. This type, however, is much more difficult to grind.

(5) Adjustable reamers possess many desirable features, but there are few, if any, that can be adjusted to cut a given diameter of hole without grinding the cutting edges each time the adjustment is made. This fact should not, however, be considered as an argument against reamers of this type, as their economy is well known, and it is certainly easier to reset and regrind

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a reamer than it is to make a new one. There are several types of adjustable and expansion reamers on the market, and they can often be adapted for use with special bars in turret-lathe operations.

Reamer Details

Some of the points of importance in connection with reamer design are brought out in the various diagrams shown in Fig. 329. The example at *A* is a sectional view through a reamer *B* and clearly shows the cutting action of the tool. In this example, the reamer is a 6-flute type having flat-relieved teeth, as shown in the detail at *C*. The teeth may be relieved eccentrically, as shown at *D*, and it is claimed that this method of relief gives a somewhat stronger tooth. An additional advantage is that it reams a smoother hole, because there is no chatter. Reamers of this type are sharpened by grinding on the face of the flute; and, as the

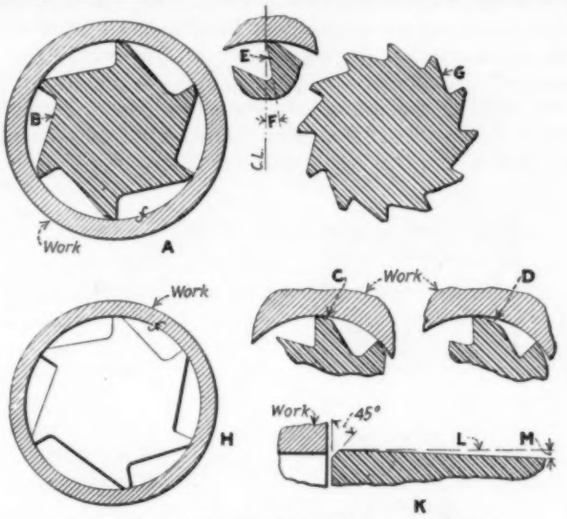


FIG. 329. DETAILS OF PLAIN REAMERS

relief is eccentric, a working size is retained for a longer period than on the flat-relieved type.

In the diagram at *E* the flute is shown in undercut form, as indicated by the angle at *F*. This practice is not generally followed, the flutes ordinarily being cut either on center or slightly ahead of center, depending upon the material which is to be cut. The number of teeth for a given size of hole must be proportioned according to the diameter of the hole. In the example at *B* there are six flutes, while in the sectional view at *G* twelve flutes are shown. In considering the number necessary, the purpose of the flute must be thought of. First, the flutes are made in order to provide a series of cutting edges; second, they allow space for chips, so that the latter will not roughen the work; third, they allow lubricant to pass between the teeth and assist in the cutting action. The number of teeth, therefore, should be proportioned so that sufficient chip clearance is provided, so that the reamer has sufficient bearing on the inside of the hole to produce a smooth piece of work, and so that there is sufficient depth to the flutes to enable lubricant to readily enter when necessary.

Manufacturers of reamers have established a more or less uniform practice in regard to the number of flutes in reamers to be used for various diameters. The designer can easily ascertain the number of flutes commonly used by reference to a small-tool catalog, and it is advisable to adhere closely to standard practice in this regard. In the example shown at *H*, the teeth of the reamer are spaced unequally in order to prevent chatter.

There are two methods in common use for spacing reamer teeth. One of them is to space all teeth a different number of degrees apart, from one to two degrees being considered a sufficient variation. There is an objection to this method on account of the difficulty of measuring the reamer, but this can be obviated by soldering a piece of brass in one of the flutes against the cutting edge. This piece will be ground with the reamer blades and measurements taken at this point. The other method is to make the teeth on one-half of the reamer unequally spaced, and follow out the same procedure on the other half in such a way that the teeth will be opposite each other.

The teeth of a reamer are usually beveled to about 45 deg. on the front end, as indicated in the diagram at *K*. For steel and cast iron the cylindrical portion of the reamer may be ground straight, as indicated by the line at *L*. For brass work or other soft materials, a slight back taper is often used, as shown at *M*. This construction prevents roughing up the hole, and gives a smoother result.

Different kinds of work require different types of reamers. Several forms are shown in Fig. 330. The example at *A* illustrates a plain type of hand reamer which is not generally used in a machine. It is practically square on the end, and is usually tapered for a part of its length so that it will enter the hole and center itself when in use. This tapered portion may extend from ½ to 1 in. from the end, according to the size of the reamer. Teeth in hand reamers are generally somewhat closer together than those used for machine reaming, as the amount of stock removed is small and chip clearance is not as important.

The tool shown at *B* is sometimes called a four-lip reamer, but as generally used, the term "core drill" is more nearly correct. This reamer is of the shell type and has a taper hole at *C*, so that it can be slipped on to a bar and driven by a key or tongue in the slot at *D*. The flutes are cut on a right-hand helix and a consid-

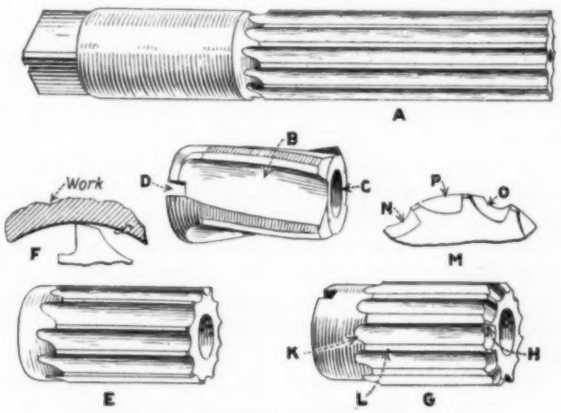


FIG. 330. TYPES OF SOLID REAMERS

erable amount of chip clearance is provided. In removing the stock from a cored hole, this tool is useful, but it is not intended to ream a hole accurately, although with careful usage very good results can be obtained by it. When properly used, it is preceded by a boring tool so as to generate the hole for a short distance.

The example shown at *E* is a plain shell reamer designed to be slipped on a bar and driven by a pin or

key. This form of reamer is commonly used for many kinds of sizing operations on turret lathes and other machines. The flutes may be either straight or helical, but if the latter, they are usually milled on a left-hand helix of long lead. Helical reamers are less likely to chatter than those which are straight, but they are

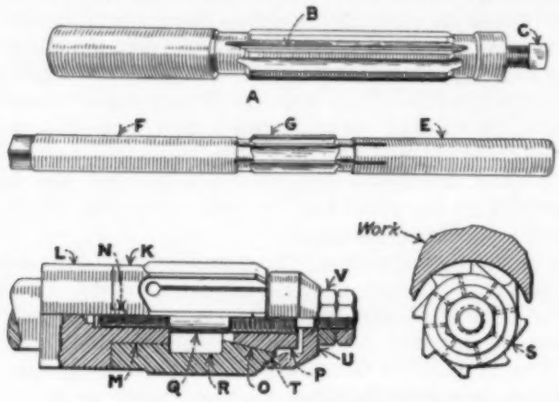


FIG. 331. TYPES OF EXPANSION REAMERS

much more difficult to grind and, therefore, are not used as frequently as those having straight flutes.

The cutting action of a reamer of the sort shown is on the end only, as previously mentioned. If ground properly, there should be no great danger of cutting holes which are oversize; but as there are several conditions to contend with, certain classes of work may require another type of reamer in order to preserve the sizes accurately. The diagram at *F* shows the position of the teeth in relation to the inside of the hole; and it is apparent that there is a possibility of a scraping action being produced here, which will naturally enlarge the hole slightly.

The "rose" type of reamer can be used on thin work when the hole must be held closely to size. An example of this variety is shown at *G*. The distinguishing difference between a rose reamer and a plain shell reamer is in the cutting of the flutes. In the rose reamer there are, strictly speaking, no flutes, but rather grooves through which lubricant and chips can be carried. The purpose of a rose reamer is to provide a tool which will positively cut only on the end, and which will obtain a cylindrical bearing inside the hole, without the possibility of any scraping or cutting action on the edges of the flutes.

Rose reamers are made in several ways, but their essential principles are the same. In the example at *G* the cutting lips at *H* are made at an angle of 45 deg. with the end of the reamer, and they extend back only a short distance. Shallow grooves are cut as indicated at *K*, these grooves being somewhat narrow so as to allow a land *L*, which acts as a bearing on the work between the grooves. In some cases, teeth are cut on the end of a rose reamer and grooves are provided at every alternate tooth only, instead of making them at every tooth.

The enlarged view at *M* illustrates the appearance of the end of the reamer when cut in this fashion. The grooves at *N* and *O* extend along the length of the reamer, but the portion *P* is solid and is cut away only at the end, as previously mentioned. The cylindrical surface of the body part is not relieved at all, but it is slightly back tapered. This taper should not exceed 0.001 in. per inch of length. Due to its cutting action, the rose reamer is likely to produce a hole slightly larger than the actual diameter of the reamer, and for this reason it is usually ground slightly smaller than the hole for which it is intended.

Expansion reamers are useful for cases when a hole very slightly larger than standard is to be reamed. In assembly work, when parts fit a trifle too closely this type of reamer is often used to remove a very small amount of metal, thus providing sufficient clearance in the hole. Ordinarily they are not considered as production tools, because the adjustment permissible is very small, and they are otherwise unsuitable. Fig. 331 illustrates several types of expansion reamers. They are usually hand operated, but it is possible to utilize them in connection with a holder, if this is found desirable.

In the example *A* several slots *B* are cut by means of a saw between the flutes of the reamer, in order to provide for a small amount of expansion. A taper plug which acts upon an angular surface at the center of the blade is controlled by movement of the screw *C*. By means of this screw the plug can be adjusted so that it will expand the diameter over the blades a few thousandths of an inch. Reamers of this kind may be made long and piloted at each end, as shown at *D*. When

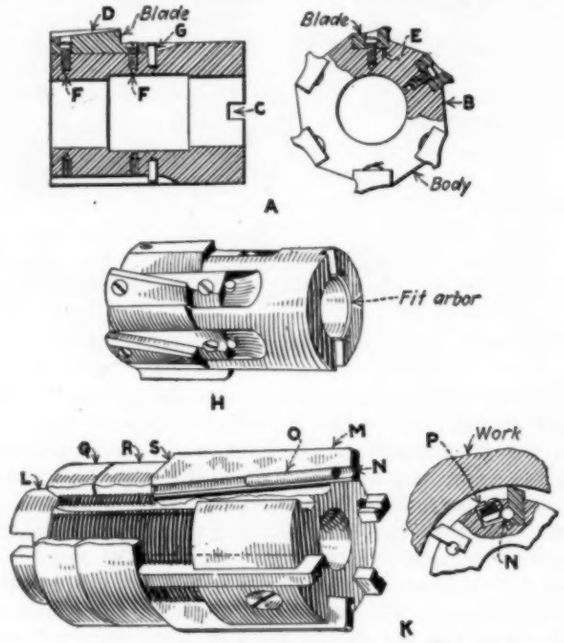


FIG. 332. TYPICAL ADJUSTABLE REAMERS

used in this way, the portion *E* is made to the diameter of the hole as it is before reaming, while that at *F* is proportioned to the size of the expanded part in the middle. For use in aligning two holes which are separated, reamers of this kind can be used. The method of expanding the portion *G* is similar to that previously described.

Various adaptations of these forms of expansion reamers can be made, the conditions under which they are used governing the design to some extent. It must always be remembered that the latitude of these tools is very small and that they should not be used in place of adjustable reamers except in cases of emergency.

Another type of expansion reamer having considerably more latitude than those previously described is shown at *H*. In this example the reamer body *K* is adapted for attachment to a shank *L*, so that it can be used for production work. The body is of shell form,

as shown in the sectional view. It is fitted to the pilot *M* and driven by means of a tongue and slot, as shown at *N*. The front end of the reamer is bored out to a taper at *O*. In this taper the conical plug *P* is carefully fitted. A stud *Q* extends through the hollow center of the reamer and is screwed into the holder.

The body of the reamer is relieved at *R* and split between each of the flutes, as shown in the end view at *S*. This is done to permit easy expansion. The end of the reamer is tapered at *T*, and a collar *U* fits over this taper. In adjusting the reamer for a given diameter, the collar and the two nuts at *V* are removed. The taper plug *P* is then screwed up by means of a spanner wrench until the proper diameter has been reached, after which the collar *U* is replaced and the nuts *V* set up and locked. This type of expansion reamer is capable of considerably greater adjustment than the others described, and may be used occasionaly for manufacturing or production work.

Adjustable Reamers

A solid reamer after it has been worn must be reground and used for a smaller diameter. Reamers with inserted blades, however, can be adjusted and reground to the same diameter for which they were originally made. Hence, this type of reamer is to be preferred on account of its upkeep, although the first cost may be slightly greater than the solid type of reamer.

Adjustments of inserted blades may be made in several ways. A very economical type is shown in Fig. 332 at *A*. The body of this tool *B* may be made up in any form, either as a part of a bar or as a shell like that indicated. In the latter case, it can be applied to a suitable bar and driven by means of the slot at *C*. The cutter blades shown at *D* are inserted in slots cut in the body of the tool at *E*. They are held in place by means of the screws *F*. A pin is provided at *G* to take the thrust, so that it will not be carried by the screws. When a tool of this sort is made, the blades are placed in position and firmly secured, after which the reamer is ground in the regular way. After they become worn, the blades are removed and paper or metal "shims" are inserted under the blades, which are replaced and reground to the right diameter.

Blades may be cut straight or helical, according to the requirements. An assembled view of a reamer of this type having helical flutes is shown at *H*. The advantages of this construction are the facts that the blades and bodies can be standardized and made up in quantity, the up-keep of the tool is excellent, and the cost is not excessive. Shims of various thicknesses, either of paper or metal, can be made up so that they can be slipped in when needed.

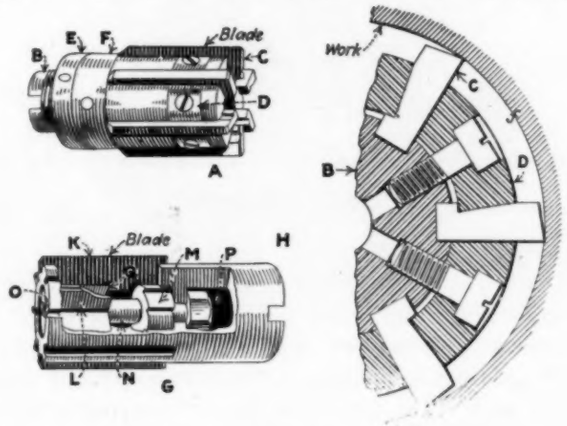


FIG. 333. OTHER ADJUSTABLE REAMERS

Another type of adjustable reamer is shown at *K*. In this example, the body of the tool *L* is of standardized shell form having an internal taper which fits a standard shell reamer arbor. Slots are cut in the outside of the body to receive the blades *M*. The slots are back tapered and the blades fit them accurately. On one side of each blade is a groove *N*, and in this groove a round hardened pin *O* is placed. This pin is forced over into the groove by means of the screw at *P*. The action not only tends to hold the blade down firmly, but also throws it over against the solid portion of the body, thus making a very rigid construction.

Adjustment is provided by means of the two collars at *Q* and *R*. The collar *R* is undercut at *S*, so that it fits over the beveled end of the blade and assists in holding down this end. The collars are set up in making an adjustment, thus carrying the blades of the reamer forward and at the same time outward. After this is done, the blades can be reground if desired. A decided advantage in this type of reamer is the fact that the blades move forward and are ahead of the body of the tool. There are no other projecting parts to catch chips or cause trouble. The blades always cut clean to the bottom of the hole.

In Fig. 333 are shown two other reamers of the adjustable type. In the example *A*, the body *B* is of shell form standardized to fit shell reamer arbors. Slots are cut in the body to receive the blades *C*. The method of holding the blades is by means of shoes shown at *D*, these being set in an annular groove around the body of the reamer. Their action when set up tends to pull the blades firmly down into their seats, and at the same time carry them over against the solid portion of the body. The construction is clearly shown in the large sectional view. Adjustment is obtained by means of the two locknuts at *E* and *F*, the latter being cut out in angular form so that it fits over the beveled end of the blade. The slots which receive the blades in this reamer are tapered toward the front end, so that smaller diameters are obtained by moving the blades forward and larger diameters by moving them backward. After setting, blades can be ground to diameter if desired.

Another type of adjustable blade reamer is shown at *G*. In this variety, the body *H* contains a number of slots which hold the blades indicated at *K*. These blades bear solidly on the hardened and ground cam faces at *L* and *M*. In adjusting the blades, the cam bolt *N* is revolved by means of the slot in the end, shown at *O*. This causes all the cams to act equally on both ends of all cutter blades. When the desired diameter is reached, the locknut *P* is tightened with a special socket wrench. The angular lug on each blade is acted upon by the under-cut portion of the cam bolt, as shown at *Q*. After tightening the locknut *P* the reamer is ready for use, or it can be reground if desired.

Adjustable reamers can be set without regrinding in some cases, but it is usually found advisable when great accuracy is required to set slightly larger than the required diameter and regrind to exact micrometer sizes. The various types of adjustable reamers shown here are thoroughly practical and extremely useful for production work. They are economical in use, and new blades can be purchased from time to time after the old ones have become worn to the maximum permissible amount.

Drilling Six Sides of Meter Frames

Twelve Duplicate Jigs Used in Batteries of Six—Machine Table Indexed—Jigs Turned Over and Accurately Located by Guides and Stops

By W. F. SANDMANN

ODD-SHAPED castings in which it is necessary to drill a number of holes from a half dozen or more sides many times become the production engineer's prize "white elephants."

The eastern plant of a large electrical goods manufacturing concern had just such a casting in the form of

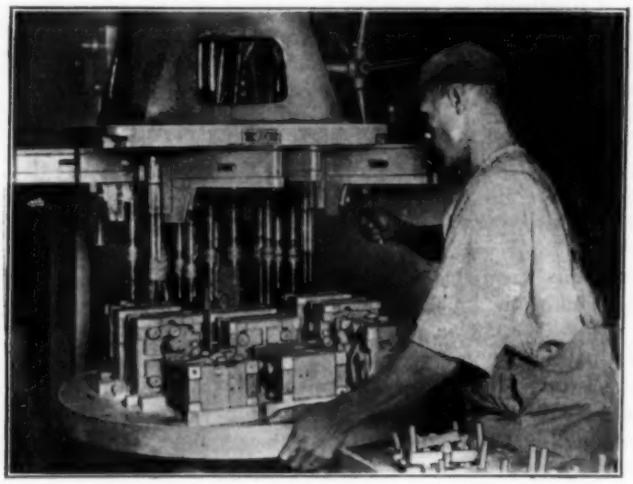


FIG. 1. SPECIAL SET-UP ON MULTI-SPINDLE DRILLING MACHINE

a meter movement frame which was produced in large quantities. The frames have a total of fifteen holes of various sizes that are so scattered around as to make it necessary to drill different ones from all six sides of the piece. On account of the relationship of the various holes to each other, it is imperative that they all be drilled before the piece is removed from the jig.

When the problem was first taken under consideration it appeared that several drilling machines would have to be used in order to attain a satisfactory production, and the jig would either have to be passed along from one machine to the other or else each operator would have to make a number of drill changes to complete the piece. Floor space was at a premium at the time and the number of machines required would occupy a lot of valuable room. To pass the jig from machine to machine would entail considerable handling and for the operator to have to change drills after every two or three holes would mean that it would be impossible to set the machine to a stop for any drill, and yet it was necessary to do this in order to drill many of the holes to an accurate depth.

The engineers of a prominent machine tool manufacturer came to the rescue, and the unique set-up shown in Fig. 1 was installed to circumvent the difficulty. A multiple spindle drilling machine was used in connection with a rotating table and twelve duplicate box jigs. Six of these jigs can be seen under the drilling head of the machine while the other six are at the front, or loading position, of the table.

The six jigs that are under the head of the machine and in the drilling position each have a different one of their six sides turned upward. At every downward stroke of the drilling head a total of fifteen holes are drilled; which is the equivalent of one completed frame. When the drilling is completed the table is indexed 180 deg. which places the six jigs that have been in front at the back of the table and in the drilling position.

In Fig. 2 is shown a close-up view of the table with all the jigs on it. While the drilling operation is being performed on the rear six jigs the operator removes the jig from position six on the front of the table and unloads a completely drilled frame from it. The jig in position five is then turned a quarter turn to the right which drops it into position six; the jig in position four is turned a quarter turn into position five; the jig from position three is brought forward, turned and set in position four; jig two goes to position three, the jig in one goes to position two, and as a consequence position one is vacant. The operator loads an undrilled frame in the jig that he has just removed from position six and places this jig back on the table in position one. By this time the drilling on the rear side of the table is completed and the table is indexed 180 deg. again.

It can be readily understood, therefore, as each jig passes through all six positions before being unloaded, and as a different side of the jig is turned up in each position, that when the jig is removed from the table at position six the frame in it will be completely drilled on all of the six sides. As the table is indexed and a jig unloaded at each downward stroke of the drilling head it is evident that each stroke is equivalent to the drilling of one frame on all six sides.

In Fig. 2 the turning blocks *A* can be plainly seen. They are rounded to facilitate the easy turning of the jig from one position to another. The guides *B* locate the jigs and they are also pushed up against the back of the turning block which acts as a locating stop.

In Fig. 3 is shown the guides and stops from the side.

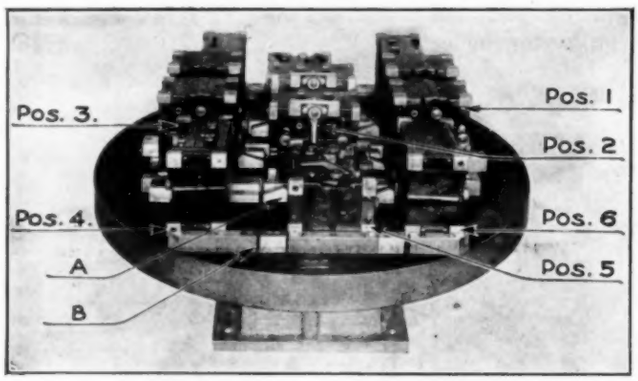


FIG. 2. HOW THE JIGS WERE ARRANGED

The frame before drilling is shown at *A*, and after drilling at *B*. The details of the compact box jigs can also be seen in this view. Hardened and ground feet *C* are located at each corner of the jigs and are ground so that there is about ten thousandths of an inch clearance where they fit in the guides at *D*. This clearance allows the jigs to have a chance to shift slightly when the drills enter the bushings so that if the distance from

the bushing centers to the feet are not the same in all cases there will be no chance of a drill being pulled to one side and broken.

It will be noted that the guides are spaced differently. This is done because the jig is turned end over end down one set of guides and side over side on the other set, and the length of the jig is greater than the width.

The frames are located in the jigs from the milled faces *E* and the lids are closed and locked by a quarter turn of the catches *F* engaging in the slotted locking posts *G*. The two thumbscrews *H* are then tightened down holding the pieces firmly in place against the drill thrusts from all the six sides.

The machine used is a "Natco" universally-adjustable

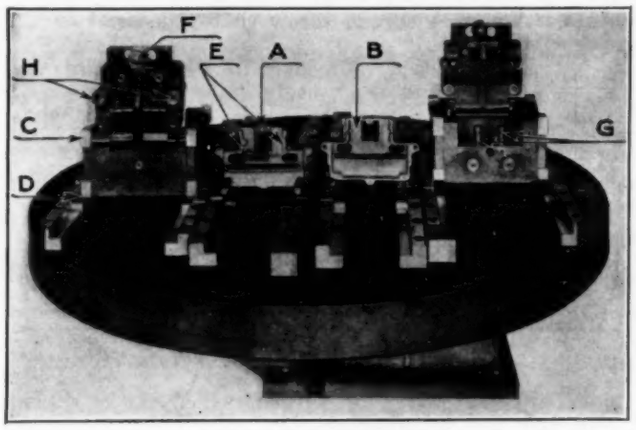


FIG. 3. THE JIG GUIDES AND STOPS

multiple-spindle drilling and tapping machine. The spindles of the machine have approximately 2 in. of vertical adjustment which takes care of the different drill lengths and hole depths, and each spindle is provided with an independent speed change so that the various drills run at proper speeds.

The drilling time is approximately 45 sec. which allows the operator time to perform the necessary unloading, loading, and turning operations. The indexing of the table requires about five seconds additional. A production of approximately seventy completely drilled meter frames per hour can be obtained with the equipment and set-up described.

Why Use High-Speed Steel in Hand Operated Tools?

BY HARRY SENIOR

From time to time I notice in your columns descriptions of reamers, taps and special tools, devised to meet emergency conditions and intended to be operated by hand, the blades or cutting points of which are to be made of high-speed steel.

For the edification of an old gray-haired veteran who "learned his trade" in the days following the close of the Civil War and who has spent the useful years of his life in chasing after the procession, will you explain to me why high-speed steel is always specified? Is the younger generation so swift in its movements that the temper of ordinary carbon steel will be drawn in hand operated tools; or is it laboring under the delusion that high-speed steel will longer retain its keenness of edge and consequent sizing and finishing capacity at slow speeds and under more severe usage than the old fashioned kind?

What Are the Worker's Prospects in the Machinery Building Industry?

BY CARL WISCHMEYER

Referring to an article under the above title on page 667, Vol. 55, of AMERICAN MACHINIST, I cannot agree with the author, Mr. Forbes, in some of his ideas. He shows, by means of curves, the wages which he thinks may be expected by various types of men in the machinery manufacturing industry and he puts the technically trained man consistently lower than the non-technical man.

There is no doubt that the man who goes to college spends money for four years, while the other man earns money during this same time. Also it will be conceded that the college man, for the first few years after graduation, will earn less than the man who has had four years or more start in practical shop work. No technical college, I believe, claims to turn out a finished product. The college course is more in the nature of a foundation on which to build a successful career. But two or three years after graduation the college man's earnings increase rapidly, and I think the curve representing this should show a more marked tendency upward, toward the right; so much so that the college man's curve should cross and go above the non-college man's within the range of the chart.

In the comparison of college men with non-college men, the mistake is too often made of comparing one man who did go to college with another man who did not. By this method we can make the comparison show whatever we want it to show. If we are arguing in favor of a college education, we can pick out a successful college man and compare him with an unsuccessful non-college man. If we are arguing the other way, we can choose a successful non-college man and compare him with an unsuccessful college graduate. The true comparison should be made on the basis of averages of a large number of men in each group.

After all, the success attained by a man depends on the type of man he is. A good man without a college education will be successful, while a poor type of man will be a failure even if he has a diploma. But in the long run I believe that the technically trained man will earn more money than the man without this training, whether in the machinery-manufacturing industry or other lines of endeavor.

The curves shown in the article do not represent conditions as they are but represent the author's views as to what should be expected. It would be interesting to plot similar curves based on actual data, if such data could be secured, and it is my belief that the curves *B'* and *C'* would cross and go above the curves *B* and *C*.

Erratum

In "Practical Helical Spring Calculation," by Alex Taub, on page 179 of AMERICAN MACHINIST, there occurred two typographical errors in giving the formula for *F*. This formula is correctly given in the left-hand column on page 182 as:

$$F = \frac{8 \times W \times (D - d)^3}{G \times d^4}$$

On page 181 in the left-hand column, the figure 8 should be inserted in the numerator. In the right-hand column, the letter *D* in the denominator should properly be *G*.

Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

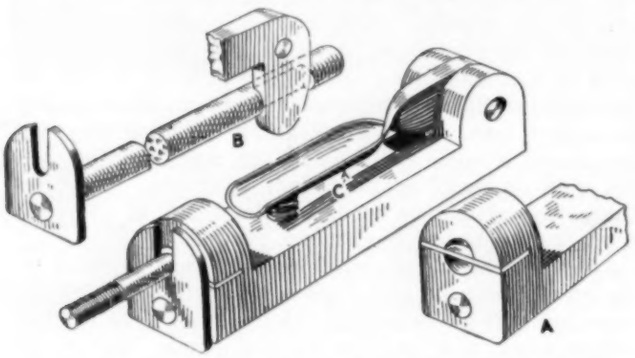
Holding Device for Re-threading Small Screws

BY CHARLES H. WILLEY

Having on hand several thousand gross of 10-32 round-head brass screws 1 in. long with ½ in. of thread, that were rendered useless by the discontinuance of the article for which they were intended, we sought a means of retrieving them for our regular product by running up the threads to the full length.

The little tool shown in the sketch was devised and made by one of our toolmakers, by means of which a boy was able to run up the threads at a rate of about two gross per hour. The tool was held in the hand and the die mounted in a high-speed tapping machine.

The recess in the end of the block *A* was fitted to the contour of the screw head and a steel blade inserted in the cross cut so that it would enter the slot of the screw. The sliding yoke *B* was operated by the bent



HOLDER FOR RETHREADING SMALL SCREWS

lever *C*, which was so placed in the assembled device that the long end came conveniently under the operator's thumb as he grasped the tool.

A coil spring opened the device when the thumb pressure was released and the operator could toss the completed screw into a box and bring the tool into position for reloading with practically a single movement.

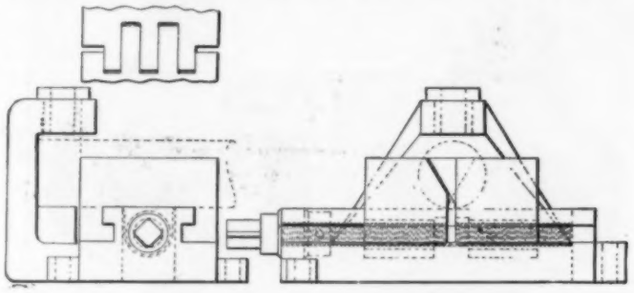
Jig for Drilling Crossholes in Round Stock

BY FRANK M. COAKLEY

On page 79 of AMERICAN MACHINIST, Gus Haessler describes a jig for drilling crossholes in round stock that is a pretty good scheme, but it has one failing in that unless the bushing is made eccentric or adjustable in some manner, the device will not enable the user to drill to center of any other size of round stock than the one it was made for.

Some time ago we had thousands of pins to make, each with a crosshole in each end, and the stock ranged all the way from ¼ to 2¼ in. in diameter. We got out several of the jigs as shown in the sketch, that would handle any size of round up to 3 in. and drill crosshole central without adjustment.

The base was at first made of cast iron, but later we used cast steel for the purpose. The jaws were forged and machined all over, being fitted carefully to the base. A square thread screw that was right-hand



UNIVERSAL VISE FOR HOLDING ROUND STOCK TO DRILL CROSSHOLES

at one end and left-hand at the other was made to operate the jaws, and when the fixture was ready to assemble, a piece of round stock with a crosshole in it was placed between the jaws centered with the drill bushing, after which the nuts were babbitted around the screw.

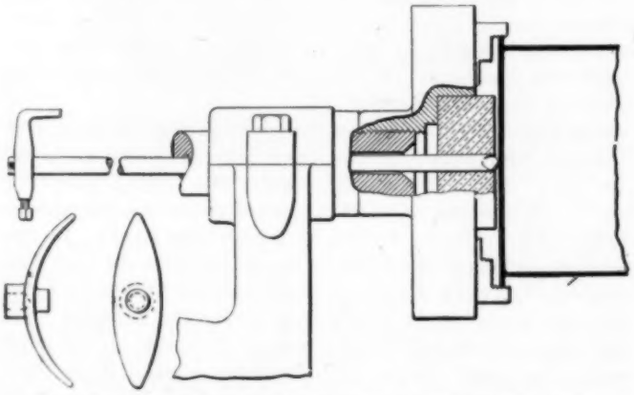
The interlocking jaws held the stock firmly and to center regardless of size, and no adjustment was necessary except to change drill bushings to suit different sizes of drills.

Boring Holes in the Back End of Work Held in a Chuck

BY J. W. THAYER

The sketch shows a method of boring holes on the inner side of work that is held in the chuck, an operation I believe to be unusual but which is effective. Many times work may be finished in one setting by means of this little kink that would otherwise require resetting.

The sketch of the trunnion for a polishing barrel is



DRILLING CHUCKED WORK FROM THE INNER END

an example. The hub can be faced off and the blind hole drilled in perfect alignment with the machined surfaces on the outside of the work, because the two operations are done at the same setting.

The sketch of the sheet-metal drum shows how I did another kind of a job very easily after wasting much time in trying to do it in some other way. The drums were 6 in. in diameter by 20 in. long and were made of 30-gage sheet metal. I had tried laying out, drilling with a small drill and counterboring to size, but this did not work as the drums were so much out of round that I could not get them true within the required limits. For the same reason a jig was out of the question.

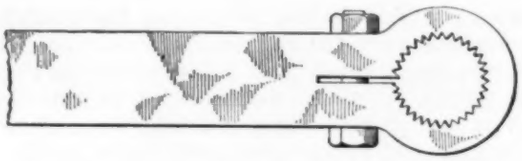
I first bushed the chuck with a brass bushing having a ⅜-in. hole through it, drilled in position. Then catching the flange of a drum in the jaws of the chuck I would true it up until it ran as true as it was practical to make it. Next I made a ⅜-in. drill point (left hand) on the end of a piece of ⅜-in. drill rod that was about 6 in. longer than the lathe spindle. Pushing the rod through the lathe spindle and entering the drill point in the bushing and holding the rod by means of a lathe dog, it was but the work of a few seconds to drill through the wall of the shell, leaving a hole that was perfectly true with the axis of rotation.

By the use of suitable bushings and tools it is quite practical to face off small hubs in this manner and thus save an extra setting of the work.

Who Remembers This Bicycle?

BY I. B. RICH

Some of my friends are trying to make me believe that shafts with multiple splines were unknown before the days of the automobile. I have recollections of



SPLINED BICYCLE CRANK AND AXLE

similar shafts at an earlier date but can't say just when.

I have a very distinct remembrance of a bicycle, a high wheel I think, in which the crank was held from turning on the axle by a series of V-shaped serrations. The crank was similarly grooved and pinched on the axle by a binding bolt as shown in the illustration. Who remembers this or a similar application of grooves or splines?

Changing the Drive on a Turret Lathe

BY W. F. HONER

The constant manipulation of an overhead friction countershaft equipped with a forward and reverse belt when operating on fast production work, creates a severe hardship on the countershaft and is a continual source of trouble. When threading or tapping operations are conducted on a screw machine, the spindle must be reversed to back off the die or back out the tap, necessitating reversing the countershaft. This continous reversal of the countershaft soon plays havoc with the best frictions, and it was this condition that led the superintendent of the Coit plant of the National Acme Company, Cleveland, Ohio, to devise the following method of eliminating this trouble, making the operating of the machine easier and less tiresome and incidentally increasing production more than 30 per cent.

The output of this plant consists entirely of screw machine product, varying in diameters up to 4 in., and made in large quantities for almost every conceivable product. Many of the smaller parts made in the automatic screw machine department require one or more

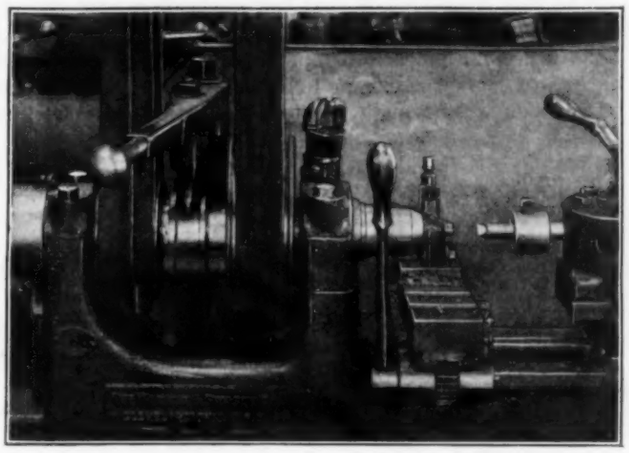


FIG. 1. REVERSING CLUTCH ON TURRET-LATHE SPINDLE

secondary operations on the back or cut-off end of the piece. These operations may consist of milling, slotting, drilling, tapping, threading, etc., and are of a nature requiring the work to be done in hand-operated turret lathes or auxiliary screw machines.

Frequently, these second operations are very speedy and in small brass parts the speed reaches as high as 500 parts an hour. From this can be seen the need of speed in shifting or reversing the countershaft as each part is tapped or threaded and the tools are backed out or off of the piece.

In the arrangement described, the cone pulley on the spindle of the hand machine was removed and in its place an attachment consisting of a Johnson friction clutch with hand lever and a large and small pulley of suitable diameters on each side, was mounted upon the spindle, as shown in Fig. 1. Both pulleys were belted to the countershaft, the smaller for the reverse rotation of the spindle, thus increasing its speed, and the larger for the forward movement. With this arrangement, the reversing friction is directly on the spindle, thereby eliminating the reversing friction countershaft.

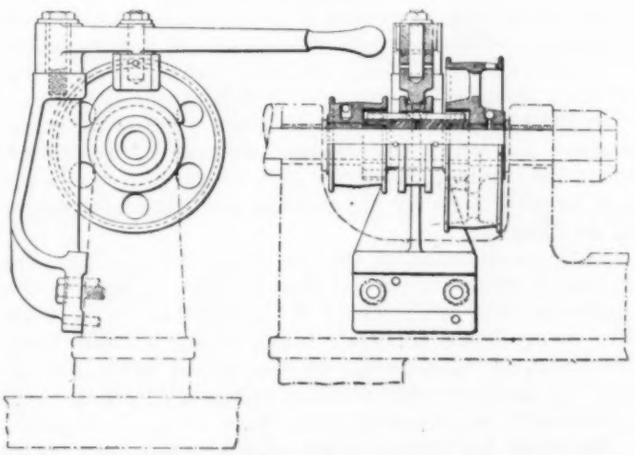


FIG. 2. DETAILS SHOWING APPLICATION OF CLUTCH

Details of the parts and method of application are shown in Fig. 2.

Among the benefits of this arrangement are: The reversing strain is confined wholly to the light spindle; the elapsed time for changing the direction of the rotation of the spindle is greatly reduced, due to the fact that the motion is directly on the spindle; the necessity for the operator to reach up to the shifter is eliminated.

The only drawback is that the operator cannot change the speed of the spindle on his machine. However, in certain second-operation departments in this plant, the nature of the product is such that many machines can be more or less permanently fixed in reference to spindle speed.

The Loose Pulley Nuisance Again

BY J. A. RAUGHT

Several articles have appeared lately in AMERICAN MACHINIST regarding loose pulley troubles, and as I have had a great deal of experience with such, I feel it my duty to give the results of some of my experiments.

My first method of overcoming the difficulty was with a cast-iron floating bushing on the loose pulley of a speed drill. This scheme worked first rate but the bushing had to be oiled daily, a duty which I was trying to get away from.

My second experiment was on the ceiling countershaft of a heavy snagging grinder. I used a loose pulley with an extra large hub, recessing the hub for an oil chamber. Then I pressed in a cast-iron bushing with several holes drilled in it and filled the chamber full of sheep's wool. This method proved more satisfactory than the former one, as the wool allowed a slow but gradual feed of oil; but in either case if one expects good results the shaft and the bushing must be highly polished to start with.

The third and last method I tried, which proved to be far the best, was a bushing made of hard maple, oil-soaked and pressed in the pulley. With the hard maple bushing the shaft must also be highly polished, as a rough shaft will grind out the bushing in a very few hours. But under all circumstances oil plays the most important part.

Jig For Drilling Crossholes in Round Stock

BY F. R. HAMMOND

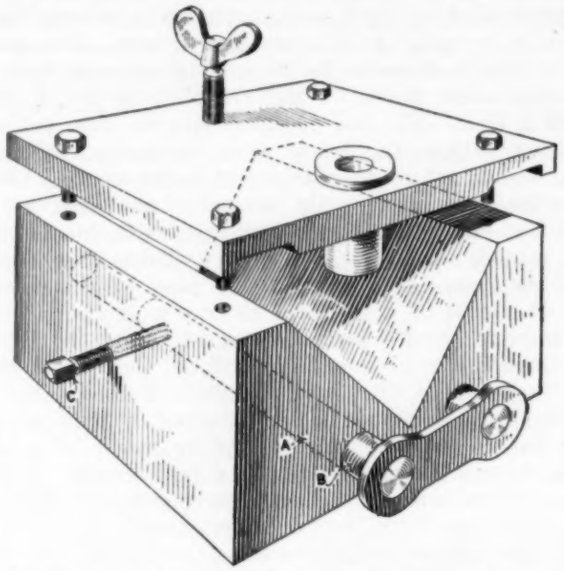
On page 79 of AMERICAN MACHINIST there was shown a jig for drilling crossholes in round stock that, though simple and efficient, was limited to one size of stock and crosshole. Further, any variation from nominal size of stock would affect the relative position of the hole.

In the sketch herewith is shown a jig for the same purpose, but which may be used with any size of stock below its maximum capacity and which will enable the user to drill to center any piece it will take irrespective of its diameter.

Little explanation of the sketch is needed. The size of the V-block should be chosen with regard to the maximum size with which it is expected to be used. The cover should be nicely fitted, either by rabbetting as shown, or with dowels by the use of dowel pins so that its position with relation to the V-block may not accidentally be changed.

Bushings for various sizes of drills should be made, each long enough to reach down to the size of stock that is to be drilled, and should be a nice push fit in the cover. The clamp screw in the cover holds the stock.

A reamed hole *A* through the block, in a direction parallel to the V-groove, fits the shank *B* of the adjustable stop, which may be set to gage the distance that the crosshole is to be drilled from the end of the stock in duplicate work. A setscrew *C* holds the stop to its setting.

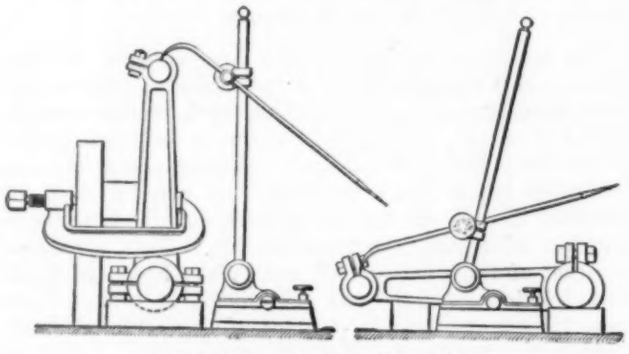


JIG FOR DRILLING CROSSHOLES IN ROUND STOCK

Testing Connecting Rods

BY G. A. LUERS

Special jigs and devices for testing the straightness of connecting rods for engines, represent special and costly equipment which may be applicable to only one length of rod. A simple and satisfactory test for any length or size of connecting rod, may be made with a surface gage and surface plate, which are usually to be found in the smallest of shops. As shown in the attached sketch, two tests of the rod are all that is necessary. To make these tests two blocks of equal height are placed on the surface plate, a mandrel is clamped in the crank end bearing and a wristpin in the small end bearing of the connecting rod. The rod is blocked erect and the surface gage point is applied to opposite ends of the wristpin. For the other test, the rod is blocked in a horizontal position and the surface-gage point again used at the ends of the wristpin. This simple test will give an accurate account of the truth of the connecting rod bearings ends, without special equipment.



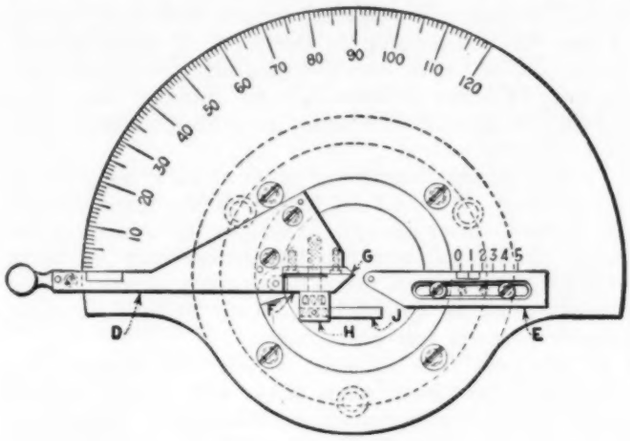
TESTING CONNECTING RODS

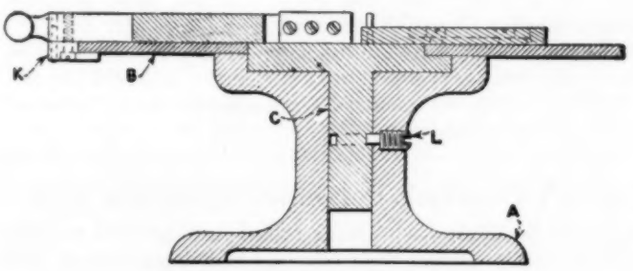
Test Gage for Flat Springs

BY E. WILMONT LARUE

The design herein described is that of a gage for testing the tensile strength of a flat steel spring that is part of a small mechanism. The stock used for this spring is 2.15 mm. in width and 0.21 mm. in thickness. These springs to be wound tight must have a means of fastening at the ends and therefore have a hole pierced in each end. One of these holes is hooked over a small pin that is driven into piece *E* shown in the illustration.

The construction of the gage is not complicated. The base *A* is made of cast iron and is counterbored and reamed to accommodate piece *C* with a running fit. The machine steel screw *L* is used to keep piece *C* in place. The graduated piece *B* is of machine steel, pack hardened, and is screwed to the base by four fillister head screws. Part *H* is tapped all the way through at





TEST GAGE FOR FLAT SPRINGS

four different angles in the vertical plane, and the small piece *J* acts as a handle and is screwed into the most convenient tapped hole in piece *H*. Lever *D* is machine steel, pack hardened, and is screwed and doweled to *C* by two fillister head screws and two dowels as shown. Piece *K* is made of tool steel, hardened, and is screwed and doweled to lever *D* by one fillister head screw and one dowel. Parts *E*, *F* and *G* are tool steel, hardened.

As explained above, the hole in the end of the spring is hooked over a pin that is driven into piece *E*. The spring is then gripped between parts *F* and *G* by tightening the screw which pivots part *F* on a dowel pin. Piece *B* is graduated in degrees around the outside edge, and graduated into divisions 3 mm. apart horizontally. Part *E* has an elongated slot that fits two fillister head screws and makes adjustment possible. The lever *D* is turned in a clockwise direction which causes the spring or work that is being tested to tighten, and the breaking point is noted on the circular graduations. This test then is really a test of the spring around the hole, where in practice it would probably break.

Part *E* could readily be redesigned to hold work that is not pierced, such as plain, narrow ribbon stock and small gage wire.

A Different Method of Making a Loose Pulley Repair

BY J. H. CARNFEL

I have often noticed in the AMERICAN MACHINIST articles in reference to troubles arising from loose pulleys and the methods employed to overcome them, and am impelled to send you an account of the way in which I effected a satisfactory repair upon a troublesome pulley.

The pulley in question was a cast-iron clutch pulley upon the countershaft of a heavy engine lathe. It was 14 in. in diameter by 4½ in. face and carried a 4-in. belt which had to be kept very tight in order to do its work. The shaft was 3⅞ in. in diameter and the pulley took its bearing directly upon it.

Because of the tightness of the belt the shaft would wear down very rapidly and then there would be difficulty in operating the clutch. To make the repair I necked the shaft down to 1⅝ in. at the place where the pulley had run. I next made a bushing of brass with a bore to run on the 1⅝ in. diameter and turned it outside to 2⅛ in. The pulley was bored to a running fit on this bushing.

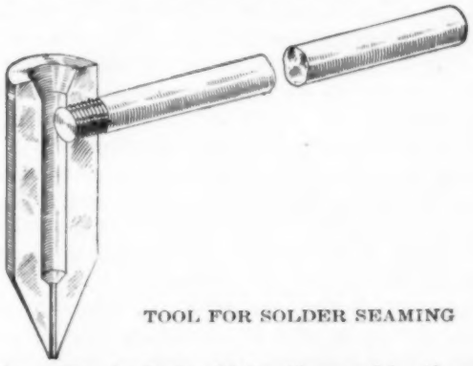
The bushing was then split and set into the necked part of the shaft, the pulley slipped over it, and the collar brought up and tightened to hold it against end movement. This job has now been in service for twelve years and is still doing duty. It is oiled once a week with machine oil placed in a cup in the pulley hub.

Soldering Iron for Seaming

BY B. F. WALLACE

Having occasion to solder a large number of seams in sheet-metal work, I devised the soldering iron shown in the sketch, which enabled me to do the work rapidly and neatly.

The hole through the center of the tool is about ⅛ in. in diameter, but the outlet at the point should be very small, not over a No. 50 drill, or the flow of molten solder will be too fast and a neat job will be difficult



TOOL FOR SOLDER SEAMING

to obtain. The tool should be thoroughly tinned both inside and outside before attempting to use it.

Though it is probably unnecessary to do so, I will for safety's sake call attention to the fact that soldering "irons" are made of copper.

EDITORIALS

The Cash Bonus Fever Is Checked

THERE is every indication that attempts to enact legislation for a general cash bonus will be unsuccessful. Steadily increasing opposition is having the desired effect on Congress. The feeling of the nation's commercial communities is plainly indicated by the recent referendum taken by the U. S. Chamber of Commerce, which resulted in 467½ votes in favor of, and 1,221½ votes against national legislation for a general bonus, whether paid in cash immediately or with payment deferred through use of certificates. Expressed in percentage, 72 per cent were against and 28 per cent for such legislation.

Some other facts brought out by this referendum cast more light on the state of the commercial mind. The total vote was heavy. Trade associations voted more strongly against the cash bonus than did the member chambers. More small organizations than usually take part in referendums voted. The underlying voting for the legislation was 92,455, against it 282,373, percentages of 25 and 75.

The proper inference is that the country is learning rapidly that the proposed legislation is not sound economically and would do more harm than good.

Data on Machine Fits

FEW who have not been actively engaged in committee work for the securing of data concerning machine practices, can realize the difficulty with which they are secured. This is not so much due to reluctance on the part of the manufacturers as to the inertia they must overcome in getting to work on collecting the data from their files and records. Most manufacturers are perfectly willing to give the desired information but do not always see just how to collect and transmit it.

There is at the present time a committee at work on securing data on the machine fits used in current practice, and they deserve the co-operation of all who wish to advance the standards of machine practice. This is an earnest attempt on the part of busy engineers, who at the request of the American Society of Mechanical Enginners in co-operation with the British Association of Engineering Standards are collecting and collating data which cannot fail to be of great value to the machine building industry.

We have led the way in the development of interchangeable manufacturing but we have not been as consistent in our methods of securing results as would have been desirable. Furthermore the lack of a standard method has added thousands if not millions of dollars to the cost of our products.

This committee has no desire to impose arbitrary standards of any kind. Its members are all practical engineers who appreciate the cost of doing work by various methods. They are giving their time to find the general practices in use, to make this data available in usable form, to the end that the best practice may be available for all who desire to use it.

In no way can the readers of the AMERICAN MACHINIST serve the machine building industry better at this time than to assist this committee by sending the chairman, Colonel E. C. Peck, General Superintendent of the Cleveland Twist Drill Co., Cleveland, Ohio, such data as they have available. Don't wait for perfect tables, send what you can *now*—and send more just as frequently as it comes to you.

A Word for Ship Subsidy

THE crutch now essential to our merchant marine may be forthcoming in the form of shipping subsidies. No one questions the necessity for a merchant marine. In order to have it, some form of help must be given to private ownership, government control having failed convincingly.

From a purely commercial point of view, we shall be vastly better off with than without a merchant marine. The immense over-capacity developed by American industry during the war can be utilized only by being provided with foreign markets for its products. Those markets must be quickly and surely reached, without dependence upon foreign bottoms.

It will take time to make a merchant marine pay. There will be times when ships will travel without cargo, because our merchant organization is incomplete. But, after we have finally recognized our dependence upon export, the merchants will branch out until they will be in every shipping port. In the meantime the ships, since we have them, must be kept ready.

The thought of spending some thirty millions or so per year with a return only distantly in sight, is not pleasant. But it should be considered as a form of national self-insurance.

Don't Overlook Personnel Problems Now

SHOP managers who have found it necessary to drop or greatly curtail their employment departments, will do well to give careful consideration to the personnel phase of management at this time. For while it is perfectly true that men can be hired on practically your own terms, it is well to remember the old saying that "well begun is half done."

Men who are hired in the right manner and with a friendly spirit will be much more content when employment becomes general once more. There is no time like the present to begin the cultivation of harmonious relations. Consideration and human understanding when employment is difficult to obtain, will have a good effect when conditions are changed.

The personal equation will always be the greatest problem in industry and will increase rather than diminish. Broad visioned managers are bearing this in mind, even with the present employment situation and will not make the mistake of antagonizing men, even at this time. A little tact and consideration now, and when re-employing men, will reap big dividends in future relations.

Buying Machinery at the Right Time

By Ernest F. DuBrul
General Manager, National Machine Tool Builders' Association

With the growing knowledge of the operations of business cycles, an increasing number of executives are now giving consideration to the planning of their businesses to run in accordance with the various phases of the cycle, instead of in opposition to those phases. One important element of executive policy is that of the purchase of equipment, which is generally done at the wrong time as a consideration of the cycles will clearly demonstrate.

A statistical study of the shipments of machine tools in relation to the business cycles of the past twenty-one years demonstrates that in years of depression orders for machine tools have been relatively below those of other metal-working industries. These statistics also demonstrate that only after machine tool users become fairly active do they place orders for replacements of old equipment; and they do not place orders for additional equipment until their need becomes very pressing.

Machine tool orders being among the very last demands to be thrown into the market, the machine tool industry has had to stand relatively idle for long periods, waiting for the effects of the rise in each cycle. The costs of these periods of necessary idleness must of course be collected from the buyers, or the machine tool builder would go out of business. This expense of idleness must also make the prices of machine tools relatively higher than prices of products that can be produced more steadily.

When the machine tool business does pick up to a point where its orders enable it to run to full capacity, the machine tool industry finds itself competing strongly with its own customers for material, and, of course, at much higher prices than existed at the bottom of the slump, which was always many months before the machine tool builder's demand came into the material market.

At precisely the time when he gets a fair amount of orders, the machine tool builder also finds himself obliged to bid for labor against his own customers, and his additional demand reacts on the labor market, pushing up wages still more. As prosperity continues or increases, costs rise at a rapid rate with every bid for labor, and with overtime and large bonus rates becoming prevalent. More serious still, the general efficiency of labor declines, and the newer employees are the relatively undesirable and shifting kind. At such times wastes become prevalent because managers are rushed to death, and cannot look after the economies they would desire; all being reflected in costs and prices.

Before prosperity reaches its crest, the new equipment installed becomes ample to supply the market for consumer goods, and machine tool orders fall off. There are some over-optimistic buyers who have over-ordered, and these cancel unfilled orders as soon as they find their own demand not continuing its anticipated increase. The machine tool shops may run for a time on old orders, but they find a serious restriction in new orders long before their customers' own demand falls off. There is a sharp contrast between sales conditions in the shops of the customers and in the machine tool shops; the sales curve of the machine tool industry shows much sharper peaks and longer depressions than that of industries producing metal goods for general consumption.

Cancellations are prevalent at the beginning of every great depression, and such cancellations leave the machine tool builder with large stocks of high cost machines on hand, through no fault of his own. Though he restricts his own production so as to fill only the actual orders that are not cancelled, he still has to suffer from the over-stock he had in process when the cancellations struck him.

According to economic law, the machine tool buyer, speaking generally, eventually pays for all this wasteful loss. If he did not, the machine tool industry would cease to exist. Much of this waste could be eliminated if the buyers of machine tools took reasonable care to anticipate their demands. If, when material prices are low and labor is available, buyers of machine tools would place their orders for their known replacement requirements, the machine tool industry would thereby give employment to men who cannot be employed in the consumer goods industries. Such employment would itself create demand for consumer goods on the part of such men and their families, and would thereby minimize the depression in consumer goods. The machine tool buyer would naturally get the benefit of lower prices.

If this policy were followed, the machine tool industry would save a lot of over-expansion now made necessary by more irregular operation. The larger investment required to take care of a peak demand makes necessary a peak profit, which must come out of the buyers of machine tools. From every point of view the machine tool buyer has everything to gain and nothing to lose by making his improvements and expansions in dull times, when he himself has more time to think about them and when all costs are relatively low.

Every dollar invested in such times is worth more than a larger sum invested later on, when the additional demand merely increases the excessive prices that come with booming.

From the above analysis of fundamental facts, it is plain that any industry that can now anticipate a necessity for improved and additional equipment should place its orders for machine tools before the next period of prosperity gets strongly under way.

What Is the Difference Between a Capitalist and a Labor Leader?

By K. B. Laidlaw

Several years ago we had a bad strike. It was brought about entirely through the efforts of two labor organizers who had a grouch against us for some reason or other. The men finally saw through these gentlemen and came back, while the organizers left town hurriedly.

We heard no more of them until about three months ago when one of them came in to see me one morning. I told him I admired his nerve in showing his face inside our shop. He said he admitted all that, but wanted to buy two of our smaller machines. Any purchaser is naturally welcome, but I advised this one not to let the boys in the shop see him.

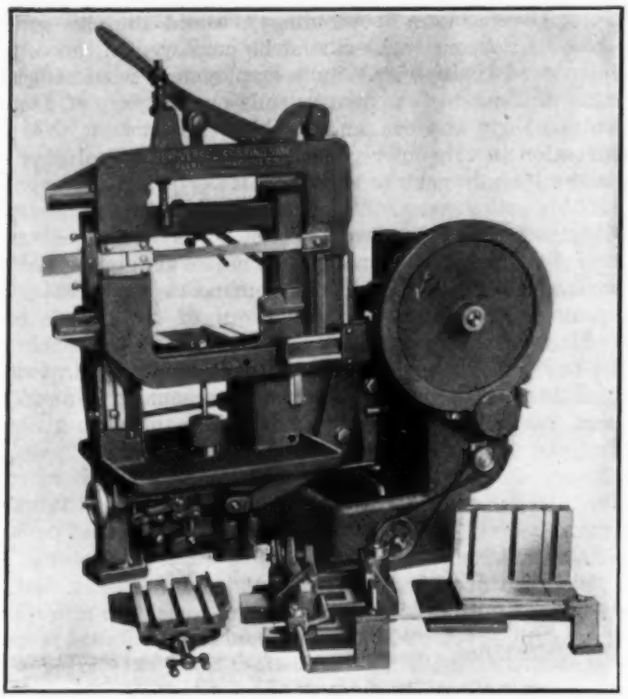
We talked a little and it came out that he had started a small shop on the other side of the town and was doing very well. He employed four or five machinists. "But," I said, "I thought you were a union organizer." "Oh, I was," he replied, "but I'm off that now, I'm a capitalist. I saved up five thousand dollars."

Apparently there isn't such a wide gulf between the labor leader and the capitalist as we are often led to believe.

Shop Equipment News

Peerless Universal Shaping Saw

The machine shown in the accompanying illustration has recently been developed by the Peerless Machine Co., of Racine, Wis., and is designated as a high-speed universal shaping saw. The machine employs a standard hacksaw blade, but incorporates many features, both in construction and method of operation, that are ordinarily found on heavy machine tools such as the



PEERLESS UNIVERSAL SHAPING SAW

milling machine. Accuracy in the construction of the machine and in the work that can be performed is especially stressed by the maker, as well as the adaptability of the machine to many jobs not possible with the ordinary hacksaw machine. Work 6⅝ in. square in section may be admitted under the blade.

The saw blade is carried by a four-sided frame, which allows the obtaining of sufficient tension on the blade without danger of distorting the bearings. The saw frame is held in bearings spaced widely apart, and is reciprocated by a crank and connecting-rod mechanism. On the cutting or draw stroke, the connecting rod is always approximately parallel with the line of travel of the blade, no matter at what height the blade is cutting. As a result of this arrangement, the cutting stroke takes place with the cutting speed somewhat reduced. During the return stroke, however, because of the great angularity of the crank, the frame is returned to its starting point at high speed.

The stroke of the machine is 5½ in., and blades from 10 to 14 in. in length are employed. The speed of cutting is changed by means of cone gears placed in a box at the rear of the machine. Three speeds of 50, 85 and 132 strokes per minute are provided. The machine is ordinarily driven by belt on a 10-in. pulley running at 600 r.p.m. It can, however, be driven by a motor mounted on the rear of the machine back of the saw frame. A 1-hp. motor running at 1,700 to 1,800 r.p.m. is sufficient.

The machine is provided with a positive power-feed mechanism. It should be noted that the saw frame is carried on horizontal bearings or ways on another frame mounted on a vertical slide on the body of the machine. At the end of the draw or cutting stroke, a cam on the crankshaft so operates as to raise the two frames, and thus lift the saw blade clear of the work while it is returning. The cam then lowers the blade to the cutting position. At the same time, a second cam on the crankshaft becomes operative, and through a suitable mechanism, pulls the saw frame down so that a positive feed is given. Adjustment of the rate of feed is accomplished by turning the small handwheel seen in front of the machine near the floor.

When the cut has been completed, the mechanism is automatically disengaged, so that the feed stops and a spring lifts the saw frames to the upper position and stops the machine. It is thus not necessary for the operator to watch the operation of the machine. The machine may also be equipped with a yielding feed, so that if a hard spot is encounted in the work, a shallower cut is automatically taken.

The machine is equipped with a vise of the type ordinarily employed on milling machines. For the performance of angle-cutting operations, the angle fixture allows of placing the work in any desired position. A fixture which adds to the range of the machine is a crossfeed mechanism that may be placed on the table of the saw. Thus a piece of work may be secured to the fixture and fed transversely under the reciprocating saw, which acts very much as the tool of a shaper and produces a smooth finish on the rough surface. Thus, the second or final finishing operation may be made very easily on another machine.

A great variety of work is possible on the machine, and many jobs ordinarily performed on a shaper or milling machine can be quickly accomplished. The attachments aid in obtaining a variety of settings. The offset blade-holding fixture is of use on certain work. The cutting of irregular shapes and the slitting of parts to be clamped in place can easily be performed.

In the base of the machine, there is a reservoir for cooling solution, and a pump and piping are provided for delivering this coolant to the blade. The height from the floor to the vise is 23 in. The floor space is 24 x 43 in. When equipped with the standard vise, the machine weighs 750 pounds.

Monitor "Thermaload" Starter

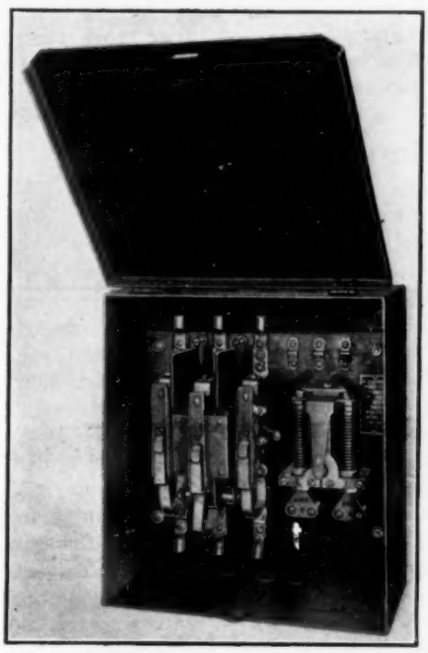
The Monitor Controller Co., Baltimore, Md., has recently developed a thermal-limit starting device for use with induction motors. The device, which is shown in the accompanying illustration, is known as the "Thermaload" starter. It consists of a three-pole magnetic contactor and a thermal-limit relay, both mounted on a

slate panel and inclosed in a metal cabinet which may be locked or sealed. The device is adapted to remote control, and is operated by means of push buttons from one or more points.

The starter gives over-load and low-voltage protection, prevents damage due to polyphase motors running as single-phase, and provides for starting at full current, voltage and torque. It is available in all sizes up to 3 hp. on 110-volt single-phase current, 5 hp. on either 220-volt single-phase or 110-volt polyphase, and 10 hp. on either 440-volt single-phase or 220-volt polyphase current.

The principal feature of the starter lies in the construction and operation of the thermal-limit relay. This relay consists of two expansion units between a fixed support and a hinged contact arm so arranged as to amplify the movement of the expansion unit several times at the contact points. Each expansion unit is a double-walled, tubular receptacle. The inner wall is smooth and closed at one end, while the outer wall is corrugated and closed at both ends. The space between the two walls is filled with tetra-chloride of carbon.

The thermal element which operates the expansion unit consists of a coil of asbestos-insulated wire attached to a piece of insulating material. Although the thermal element is in series with the motor, the voltage drop is slight, and the resistance is very low. Thermal elements of 9 amp. capacity and greater are made of copper wire, and those of a lower capacity of low-resistance alloy. The action of the thermal element in expanding and contracting is, naturally, rather slow and deliberate, and thus prevents breaks due to small fluctuations. Should the line carry too heavy a current, the element would become heated and the expansion member open the circuit. Very brief overloads greatly in excess of the rated load can be carried, as the thermal element requires sufficient time in which to act. Such overloads do not, of course, injure the motor. After the motor has been disconnected by the tripping of the relay, it cannot be started again unless the starting button is pressed.



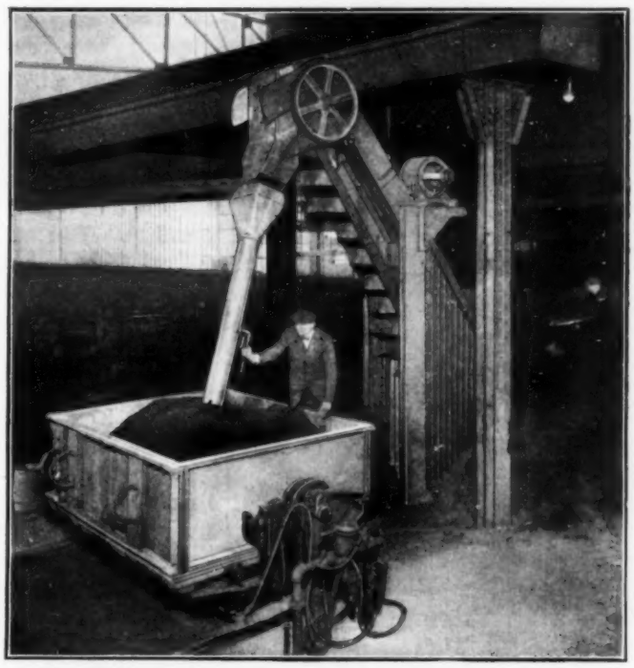
MONITOR "THERMALOAD" STARTER

The device automatically cares for overheating of the motor that may occur due to the temperature of the room. It can readily be adjusted to open the circuit at the temperature desired. In order to change the apparatus from one rating to another, it is necessary merely to change the thermal element. Due to the simplicity of the construction and the arrangement, this change can be readily performed.

Osborn Stationary Flask-Filling Machine

A machine intended for use in the foundry for filling large flasks is shown in the accompanying illustration. It has recently been placed on the market by the Osborn Manufacturing Co., 5,401 Hamilton Ave., Cleveland, Ohio. The entire machine is self-contained, and stands without any outside support. The frame is made up of structural steel with suitable provision at each end for supporting sprocket wheels. Standard link chains carrying special shaped buckets run on the sprockets, so that sand can be raised from the floor to the top of the machine when the buckets are running.

The sprockets and chain are driven by an electric motor, the capacity of which depends upon the amount of sand to be handled. For lifting 2 cu.yd. of sand per minute, a 15-hp. motor is required. The sand may be taken from the floor level, or from a pit below the floor. The machine operates only during the time required to fill the flask. The amount of wear that occurs is thus slight. Both starting and stopping are easily under the control of the operator by the use of push buttons, located at the end of the discharge chute.



OSBORN STATIONARY FLASK-FILLING MACHINE

At the upper end of the machine is attached the flexible discharge chute, so located that sand may be spread to all corners of the flask after it has been lifted to the top of the machine by the buckets. Since the machine is stationary, the flasks may be brought to it on small cars. The machine may be made portable, so as to serve a row of molding machines, and thus keep it busy for a greater proportion of the time.

It is stated that a great saving in time is possible by the use of the machine. Since the machine, as shown, is capable of handling 2 cu.yd. of sand per minute, a large flask may be filled in two or three minutes. The time required for two men to shovel the sand into the flask by hand would be about an hour and fifteen minutes. The production of molds may thus be increased by the use of the machine. In one case, as the result of a test, it is stated that the production was increased from five to fifteen molds per day.

Blettner Reamer Driving Machine

The George H. Blettner Co., 1841 W. Jackson Blvd., Chicago, Ill., has recently developed for driving reamers the machine shown in the accompanying illustration. The machine is not intended to supplant larger machines, but rather to furnish power for the reaming operations that are ordinarily done by hand. It is claimed that not only is the reaming time greatly reduced, but also a hole reamed by the steady power drive is smoother than that finished by intermittent reaming as done by hand.

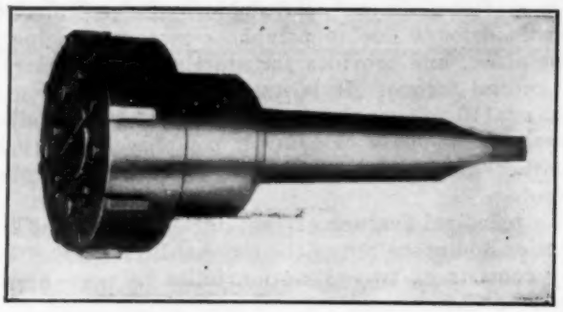
The machine will drive hand, expansion, adjustable or special reamers up to 1½ in. in diameter. The spindle speeds are 10, 20 and 30 r.p.m. The spindle is fitted with a 5-in. Cushman geared scroll chuck. The bearings are bronze bushed. The machine is motor-driven through a hardened and ground worm and wheel, and the end thrust of the worm is taken up by ball thrust bearings. The gear case is oil-tight, with a stuffing box on the wormshaft. Power is transmitted to the worm by a round belt running on a three-step cone pulley. The distance from the floor of the center of the spindle is 38 in., while the height overall is 42 in. The floor space required is 18 x 18 in. The weight is 145 lb. net, and 195 lb. crated. The motor has ⅓ hp. and can be supplied for either a.c. or d.c. of 32, 110 or 220 volts. The switch is mounted on the machine, and is of a self-contained, tumbler type. An extension cord and attachment plug are supplied. All running parts are enclosed. The finish is baked black enamel.

BLETTNER REAMER DRIVING MACHINE

Campbell Expanding Cylinder Reamer

The Campbell Auto Works, 238 N. El Dorado St., Stockton, Cal., has recently placed on the market an expanding cylinder reamer, shown in the accompanying illustration. The tool is intended for re-boring and finishing automobile cylinders. The head screws on a boring bar, so that it can be fitted to any type of cylinder boring machine. It may also be used for turret machines. It has an expansion of approximately ⅜ in. The only tools necessary for making adjustments are a screw-driver and a micrometer.

The adjusting mechanism is concealed inside the head, so that no dirt or chips can interfere with the action. In making adjustments, the blades remain in the same relation to each other as before, and it is stated that they do not need to be reground after adjusting, in order to true them up. The front plate is removed from the head by loosening the eight screws holding it in place. The plate is caused to rise by means of four coil springs



CAMPBELL EXPANDING CYLINDER REAMER

imbedded in the body under it, thus permitting the cutters to slide easily in the slots. By turning the large central adjusting screw, the blades may be forced outward or inward, as desired. The blades are held against the adjusting screw by means of four coil springs.

After the adjustment has been made, the eight screws are tightened into place and the blades thus locked in position. The tool is said to be capable of boring holes that are perfectly round and do not taper more than 0.00025 in. It is made in several sizes, the largest of which is 4½ in. in diameter.

Reed Inside Micrometer

An inside micrometer for obtaining internal measurements of cylinders and rings has been brought out recently by the Reed Small Tool Works, Cherry and Vine Sts., Worcester, Mass. The tool is of use as well in linear measurements, testing parallel surfaces, comparing gages and setting calipers. The diameters of the barrel, spindle and thimble are the same as those in the Reed outside micrometer. This construction affords a sturdy tool, adaptable to garage and repair shop use. The large surfaces allow for figures of a generous size on the sleeve and barrel, and for wide-spaced graduations to thousandths of an inch.

One feature of the micrometer is the opportunity to change the position of the detachable handle to make it convenient for right- or left-handed work, so as always to give a full view of the graduations on the barrel. This handle also makes it possible to take measurements in holes or other inaccessible places, or to

REED INSIDE MICROMETER

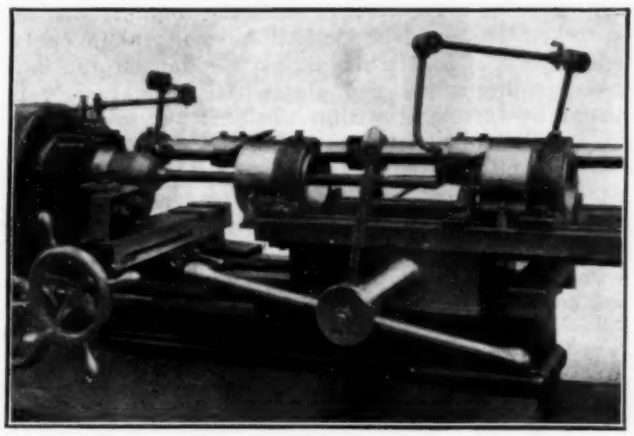
gage throughout the length of a cylinder bore for a better average measurement.

The range, or run, is 1 in. The extra rods, which unscrew from the threaded stud at the end of the barrel, allow for a quick change of length. Each rod is internally threaded and ground square at the hardened end, which sets squarely against the barrel. At the point of measurement it is fitted with a hardened tool-steel anvil with an adjustment for increasing the length when worn down. The anvil faces are ground on a comparatively small radius, thus rendering the micrometer adaptable to the measurement of either parallel or curved surfaces.

The standard set consists of the inside micrometer, an adjusting wrench and five rods, giving a range from 3 to 8 in. Additional rods can be furnished for measuring greater lengths, also a handle for gaging to greater depths in cylinders.

Warner & Swasey Staybolt Threading Machine

The Warner & Swasey Co., Cleveland, Ohio, has recently placed on the market a machine for use especially in a railroad shop for threading staybolts. The machine



WARNER & SWASEY STAYBOLT THREADING MACHINE

is made up of the standard No. 4 turret lathe with a special attachment instead of the regular turret slide and saddle. The accompanying illustration shows the attachment in place. When not used for threading staybolts, the regular turret slide and saddle may be replaced on the machine and used for the production of the studs and bolts ordinarily found necessary in a railroad shop.

The machine handles crown stays, button-head stays and swivel stays up to 40 in. in length, and cuts any size of thread. Self-opening die heads of the size necessary can be employed. On upset staybolt forgings, a taper may be formed under the head and threads cut on the end and also under the head, at the rate of about one bolt per minute. No previous machining is required for the thread on the end.

The rough forging is passed through the back of the forward die head to insert it in the square collet in the atuomatic chuck. The die head has an enlarged hole in the shank, and the chasers have an especially large opening movement, so as to receive the button-head stay. After the staybolt is chucked in position, the staybolt carriage is fed forward until the end of the bolt is supported in the steadyrest between the two heads. The head is then formed by a forming cutter on the cross-slide, while the other end is supported in the steadyrest. Then the staybolt carriage is fed forward, and the die heads, operated by the cams on the rear bar, close automatically and cut the threads.

The cams may be made to produce any type of thread desired, as the action of the head is dependent upon their contour. As soon as the die heads reach the end of the cams both die heads open. The carriage is then brought back and is ready for the next staybolt. The die heads are placed so that they cut the thread on the end and under the head in continuous lead.

Peerless Hand-Operated Valve Lathe

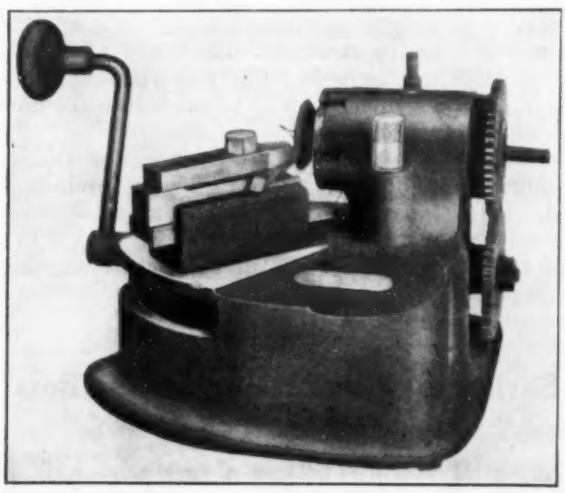
The accompanying illustration shows a small bench lathe built by Steiner Brothers, Lima, Ohio, for refinishing automotive poppet valves. The valve is held in place in the hollow spindle by means of a special self-centering chuck. This chuck consists of three contact points at each end of the spindle, the points being operated by means of three-lobe cams, so that they move toward the center or recede uniformly with the rotation of the cam.

The valve is rotated by means of the lever shown at the left, and the two spur gears at the right serve to transmit the motion to the spindle.

Valves having stems from $\frac{1}{4}$ to $\frac{9}{16}$ in. in diameter and heads up to 3 in. in diameter can be held. Valve stems having two diameters can be accommodated, since the two chucks operate independently of each other. The valve is rotated by means of the lever shown at the left, and the two spur gears at the right serve to transmit the motion to the spindle.

A high-speed cutting tool $\frac{1}{4}$ in. square in sections is employed. It can be easily removed and sharpened. It is mounted in a slide that can be swung through an angle of over 30 deg. Thus, at the central position 45-deg. valves are faced, while 30- and 60-deg. valves are faced at the two extreme positions. As the driving handle is turned, the toolslide is automatically fed inward. This action is accomplished by means of a worm and spur gearing connecting the driving shaft to the slide.

The worm wheel can be disengaged by means of the



PEERLESS HAND-OPERATED VALVE LATHE

knurled knob shown at the side of the spindle housing to permit of adjusting the position of the slide when setting up. When this knob is depressed, the tool slide

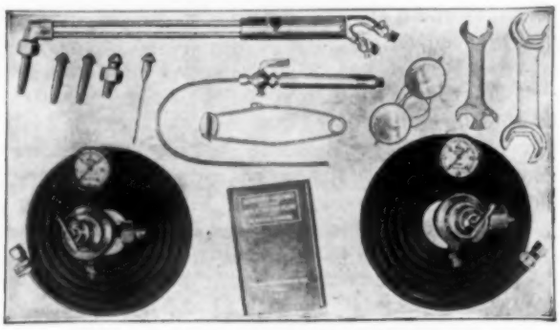
can be moved by hand to its starting position, in order to start another cut. In this way, very light cuts can be made; and if it is desired to increase the depth, it is very easy to return the tool to the starting position in the manner just stated.

The range of movement of the tool is controlled by a segment that disengages the movement before any jamming of the tool carrier occurs. Since the feeding mechanism is located inside the body, it is protected from dirt and injury. Due to the fact that the feeding motion of the cutting tool is uniform, a smooth finish is turned on the seat of the valve.

Rego "Little Six" Welding Outfit

In the acompanying illustration are shown the component parts of a welding outfit recently placed on the market by the Bastian-Blessing Co., 125 W. Austin Ave., Chicago, Ill. The outfit is made up of standard units of Rego equipment. It is known as the "Little Six," and is intended primarily for use in garages for handling general repair work.

The welding torch is equipped with three copper one-piece welding tips. It will weld steel up to 1 in. in thickness, and is suitable for the ordinary range of repair work. Its construction is intended to prevent flashing back. By replacing the welding tip with a cutting tip, the torch can be adapted to the cutting of steel up to 1 in. in thickness. Any sort of brazing can be performed with the small tips that are furnished. Lead burning or welding, as in battery-repair work, can



REGO "LITTLE SIX" WELDING OUTFIT

be performed by the outfit with the use of a special tip furnished for this purpose. For repairing radiators, a tip 3 in. long is provided, so as to reach into the honeycomb of the cracked radiator.

For removing carbon from the combustion chambers of automobile cylinders, a decarbonizing torch is provided. This is a separate tool, and not an attachment to the welding torch. Other apparatus furnished with the outfit consists of the oxygen and acetylene regulators, hose, wrenches, spectacles, spark lighter, and an instruction book.

Saving Time in Looking for the Boss

By W. A. Sailler

The writer recently noticed a very good kink in a jobbing machine shop which apparently was a great time saver and convenience. Because of the nature of the work done it was necessary for the machine hands in various parts of the shop to consult frequently with the superintendent as to the details of the work, etc. Under the old arrangement, it became necessary for the operator to leave his machine and go to the shop office to see the foreman or superintendent unless he happened to be passing by. During all the while the operator was seeking the superintendent the machine, of course, was lying idle.

To eliminate this time and production waste, the shop was laid out into 10 convenient zones, and in a central place in each zone was placed a push button which connected with a call board in the shop office—each zone being identified by its own number. If an operator in Zone 9 wanted to consult with the foreman or shop superintendent instead of tracking the entire length of the shop to the shop office, he merely stepped to the push button for Zone 9 and signalled for the superintendent. If the superintendent was not in the office, the shop office boy sought him out.

It was the experience in this shop that this simple expedient resulted in a saving which amounted to about 2 per cent of the productive time—quite an important item in its effect on profits. All big shops have good call systems, but many small ones do not.

Farm Machinery Needed in Latvia

Farm machinery is very much needed in Latvia, according to recent reports from trade commissioner H. Lawrence Groves. The Central Agricultural Co-operative Society, of Latvia, has issued a statement outlining these requirements, and states that this machinery should be furnished within the next two years. At present the intention is to replace only the machinery destroyed or removed as a result of the war. This does not cover the needs arising from the large number of farm units established in the last few months through the operation of the government's reform act.

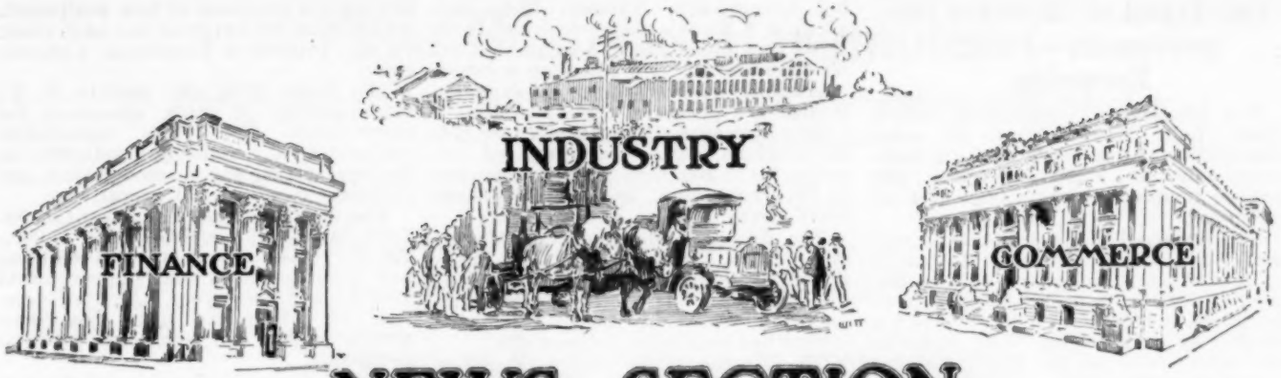
The machinery most needed is as follows: One and two bottom plows, 11,000; 2,500 harrows and pulverizers; 1,200 cultivators; 550 seeding machines; 3,000 grass mowers; 1,500 grain harvesters (probably "dump" reapers); 3,000 horse rakes; 500 potato diggers; 100 thrashing machines, with self feeder; 25 tractors.

In Latvia the farms are usualy small and light machinery enjoys a brisk market. The combined reaper and mower has not gained the confidence of the local agriculturists, who seem to prefer the reaper and mower as separate machines.

The importation of farm machinery in Latvia is now entirely in private hands, the government having abandoned its former activities in this line. Agricultural organizations are now making an effort to obtain financial assistance from the government in the form of subventions to assist the farmers in the purchase of needed machinery.

German and Swedish manufacturers are keen competitors in the Latvian market, and in the past the advantage has been on the side of the Germans. Of late, however, machinery of German make has not been of satisfactory quality, and there has been an increasing demand for American-made machinery. New agencies have been established and the local net price of American machinery compares favorably with that of the German machines.

Generally, the largest purchasers of machinery are the co-operatives, and in Latvia there are three important ones. Also many purchases are made through the central co-operatives in Lithuania and Esthonia.—*Commerce Reports.*



NEWS SECTION

Metal Industries Paid $457,-251,793 Tax in 1919

Companies engaged in metal manufactures in the United States in 1919 paid a total tax of $457,251,793. In all 13,188 companies were engaged in this industry. Of that number 9,689 companies had net incomes totaling $1,789,-212,574; the remaining 3,429 companies had deficits totaling $119,834,070.

The number of corporations and the total net income of each group is shown by the following: Crude and refined metal production, 158 companies, net income $38,266,652; stock products made in foundries or rolling mills, 2,158 companies, net income $449,896,677; agricultural machinery, steam appliances and construction machinery, 826 companes, net income $160,089,853; metal-working and paper-making machinery, heavy ordinance, rolling stock, safes and vaults, 445 companies, net income $122,516,791; general electric machinery, stationary and marine engines, and refrigerating machinery, 343 companies, net income $66,930,812; motor vehicles, airplanes and spare parts, 302 companies, net income $233,814,078; boot and shoe machinery, typewriters and calculating machines, gas and electrical fixtures, 335 companies, net income $73,237,804; metal furniture, ornamental iron work and sewing machines, 106 companies, net income $5,-695,385; fire arms, hardware, cutlery, hand and machine tools, and gages, 4,378 companies, net income $428,035,-834; all other metal products, 2,877 companies, net income $130,427,740; smelting and refining (base metals), 623 companies, net income $4,512,149; smelting and refining (precious metals), 567 companies, net income $26,285,275.

These figures are taken from a recent compilation made by the Bureau of Internal Revenue.

Secretary Hoover Talks to Business Paper Editors

The monthly meeting of the editors of the National Conference of Business Papers with Secretary of Commerce Hoover, was held in Washington on Feb. 27. Mr. Hoover discussed various national problems. At a luncheon meeting, Col. Nelson Gaskill, chairman of the Federal Trade Commission explained the purpose and work of the commission.

The editors met during the afternoon with the Chamber of Commerce of the United States.

Senate Has Screw Thread Commission Bill

The bill extending the life of the National Screw Thread Commission for a period of five years has been reported to the Senate by the Committee on Manufactures, with the recommendation that it be passed by that body. The committee also recommended that the legislation receive early consideration. The measure has already passed the House. In reporting the bill to the Senate, the committee quoted from the testimony of Secretary Hoover and Director Stratton, which was given before the House committee, no hearings having been held by the Senate committee.

Iron and Steel Exports

Exports of iron and steel in January amounted to 157,000 tons, the largest since April of last year. Exports of copper totaled 53,130,000 pounds, which was a decrease of over 8,000,000 pounds from December. Imports of tin increased to 8,103,000 pounds and were larger than for any month of 1921.

Safety Code for Grinding Wheels Approved by Standards Committee

The sectional committee appointed under the joint sponsorship of the Grinding Wheel Manufacturers Association of the United States and Canada, and the International Association of Industrial Accident Boards and Commissions, has made its report on a safety code for abrasive wheels. The code has been approved as tentative American standard by the American Engineering Standards Committee.

The code contains rules and specifications considered necessary to insure safety in the use of abrasive wheels operating at speeds in excess of 2,000 surface feet per minute. It consists of sections dealing with scope, types of protection devices, storage and inspection of wheels, general machine requirements, protection hoods, work rests, protection of wheels, flanges, mounting, speeds, operating rules and general data.

Copies of the code may be secured from the American Engineering Standards Committee, 29 West 39 St., New York City, for ten cents.

Exports to China Still Below 1920

Exports from the United States to China for the year 1921 were $108,290,-435, in value, which is an enormous increase over the $24,872,745 of 1913-14, although a considerable drop from the $145,737,321 of 1920, when the high price of silver tended to increase the buying power of the Chinese and to stimulate imports of all kinds. When the drop in silver occurred, it became extremely difficult for the Chinese purchasers to pay for the goods already ordered, and the ports were congested with imports, which have been absorbed only very slowly, as the return to normal trade conditions was greatly delayed by the famine in northeastern China, and by unsettled political conditions in many places. It is surprising under the circumstances that the decrease in our exports to China was not greater, and the situation is a proof of the fundamental soundness of the economic conditions in China, which enabled the business of the country to resist so many unfavorable tendencies.

Reductions in Idle Freight Cars Continues

Reports received by the car service division of the American Railway Association show that on Feb. 15, a total of 449,819 freight cars were idle because of business conditions, compared with 467,997 on Feb. 8, a reduction of 18,178.

Surplus cars, that is cars in good repair and immediately available for service if necessary to meet traffic conditions, consisted of 278,481 cars of the total, while the remaining 171,338 represented the number of idle freight care needing repairs in excess of the number normally in bad order.

Surplus box cars numbered 104,513 on Feb. 15, a reduction within a week of 17,015 cars, while surplus coal cars totaled 112,050 which was a reduction of 11,069 within the same period.

Maryland College To Teach Foremanship

A course in foremanship training, under the Smith-Hughes Act, has been established by the School of Commerce of the University of Maryland, Baltimore, Md. It provides training for men, without expense to them or to their employers.

The Trend of Business Improvement—Plants Resuming

The Studebaker Corporation, South Bend, Ind., manufacturer of automobiles, has increased its working force from 6,000 to 8,500 employees, the largest number of operatives ever at the plant.

The Freeland Bobbin Works, Freeland, Pa., manufacturers of textile equipment, is arranging for the immediate resumption of operations at its plant, which has been idle for a number of months past. The company has taken an order for 35,000 bobbins and other equipment.

The Conners Steel Co., Birmingham, Ala., has resumed operations at its steel hoop and band mill, following a period of curtailment.

The Bateman Companies, Inc., Grenloch, N. J., manufacturer of agricultural implements, has resumed production at its local plant on a full-time basis, following a curtailment for about three months. Practically all of the former operatives are employed at the plant. An extra hour has been added to the regular working day.

The Newport News Shipbuilding and Drydock Co., Newport News, Va., will add from 1,500 to 2,000 men to its working force about the middle of March, following the arrival of the "Leviathan" at the plant, for which a reconditioning contract has been received from the Government.

The Baltimore & Ohio Railroad Co., has re-opened its heavy repair shop at Cumberland, Md., following idleness for about two months past. Employment will be given to approximately 300 men.

The Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., has resumed production at its structural steel mill at Fairfield, Ala., following a period of curtailment.

The El Paso & Southwestern Railroad Co., El Paso, Tex., has resumed operations in all departments at its local shops, following a shut down for a number of weeks. Employment is being given to about 325 men.

The American Locomotive Co. is maintaining active operations at its Brooks Locomotive Works, Dunkirk, N. Y., giving employment to a large working force. Production is concentrated on twenty-five large locomotives for the Northern Pacific Railroad and a quantity of repair work.

The Erie Railroad Co., 50 Church St., New York, has leased its repair shops at Meadville, Pa., which have been closed for some time past, to W. S. Schlafge, head of the mechanical department, who has secured a leave of absence to operate the plant. The shops will be reopened at once for full capacity production, under the private management, giving employment to more than 800 men. Contract work will be handled for the railroad.

The American Car & Foundry Co. has received an order for the repair of 500 cars for the Delaware, Lackawanna & Western Railroad, and will handle the work at its Berwick, Pa., plant.

Sotter Brothers, Inc., Pottstown, Pa., manufacturers of boilers, tanks, stacks, etc., has resumed operations at its plant under a regular eight-hour day working schedule, following a curtailment of a number of weeks.

The Transue & Williams Steel Forging Corporation, Alliance, Ohio, has adopted a double-shift working basis at its local plant to handle production for recent orders. The company resumed operations at the plant in January, following a period of curtailment.

The National Cast Iron Pipe Co., Birmingham, Ala., has received an order for 1,200 tons of pipe for use at St. Paul, Minn., and for 1,000 tons for delivery at Port Arthur, Tex.

The American Bushings Co., Marysville, Mich., manufacturer of brass piston bushings for automobile engines, has placed its plant on a double-shift operating basis. A record volume of orders has been received recently.

The Western Steel Car & Foundry, Chicago, a subsidiary of the Pressed Steel Car Co., Pittsburgh, Pa., has secured an order for 500 gondola cars from the Great Northern Railway Co., and will handle the work at its Hegewisch shops.

The Chesapeake & Ohio Railroad Co., Richmond, Va., will soon place orders for about 18,000 tons of steel rails.

The H. H. Franklin Co., Syracuse, N. Y., has arranged a fund of $5,000,000, for the establishment of a new plant to be devoted exclusively to the manufacture of a light four-cylinder, air-cooled automobile. The proposed works will be designed for a capacity of 50 complete cars a day under one-shift operating schedule, and 100 cars with double-shift operation, giving employment to more than 2,000 men. The company is reported to be negotiating with the receivers for the Willys Corporation for the purchase of the nearly completed plant on Newark Avenue, Elizabeth, N. J., including the former works of the Duesenberg Motors Co., adjoining. The Willys plant is said to represent an investment in excess of $5,000,000, and was laid out for the manufacture of a six-cylinder automobile, to be known as the Chrysler Six.

The Baltimore & Ohio Railroad Co., has added about 100 men to the working force at its shops at Keyser, W. Va., placing the plant on a full operating schedule.

The McIntosh & Seymour Corporation, Auburn, N. Y., manufacturer of engines, has received a contract for the construction of ten 150-hp. Diesel engines, for use on the State barge canal.

The American Rolling Mill Co., Middletown, Ohio, has resumed operations at its Central Works, which have been idle for some time past. All of the mills of the company are now in service for the first time since Jan. 1921.

The Denver & Rio Grande Railroad Co., Denver, Colo., will soon place orders for the construction of twenty Pacific type locomotives.

The Slatington Steel and Iron Co., Slatington, Pa., has resumed operations at its bar mill, following a shut down of several months.

The Hyatt Roller Bearing Co., Harrison, N. J., is increasing operations at its plant and adding to the working force. Preference is being given to former employees and notifications are being issued for the men to return to work.

The New York, New Haven & Hartford Railroad Co., New Haven, Conn., is planning for a fund of $3,000,000, for extensions and improvements to road, shops and other property; and $2,066,000 for the purchase of new equipment. Application for approval has been made to the Interstate Commerce Commission.

The Houde Mfg. Co., Buffalo, N. Y., manufacturer of shock absorbers for automobiles and other automotive equipment, is increasing production at its local plant, and is now giving employment to about 150 operatives.

The Great Northern Railroad Co., St. Paul, Minn., will expend about $7,000,000 for track extensions and building and shop additions and improvements during the present year. An appropriation of $4,000,000, also, has been arranged for the purchase of new equipment.

The Harrisburg Machine and Electric Welding Co., Eighteenth and Chestnut St., Harrisburg, Pa., has adopted a capacity production schedule in all departments.

The United States Cast Iron Pipe and Foundry Co., East Burlington, N. J., has secured an order for 9,000 tons of pipe from the Peoples' Gas Co., Chicago, Ill.

The Lacey Manufacturing Co., Bridgeport, Conn., is operating its plant to capacity six days per week, and has sufficient business to keep fully occupied for a year upon the present schedule. The company makes special tools, dies, fixtures and machinery on contract.

The Grant Manufacturing and Machine Co., Bridgeport, Conn., through its manager, Mr. Kingsbury, reports a steadily and consistently increasing volume of business for the last four months and looks for a complete return to normal conditions in all lines this spring. The concern builds riveting and wire machinery.

The Haskell-Barker plant at Michigan City, Ind., recently taken over by the Pullman Co., according to reports from Chicago, is operating on full time.

The New Departure Manufacturing Co., Bristol, Conn., is reported running full time with a force of 2,000 employees. Since this company normally employed about 1,100 persons in 1914, the present figures are a good sign of prosperity. It is said the company is operating almost 100 per cent in excess of pre-war business.

The Charles H. Besly Co., of Chicago, Ill., reports it has received more orders for Besley disk grinders and accessories during February, than during any given period since November, 1920.

Stinnes to Operate Ships on the Danube

Edwin C. Kemp, American Commissioner at Budapest, reports to the Department of Commerce that owing to numerous obstacles to the expedious handling of rail traffic through the succession states, the Stinnes group of Germany is reported to be placing orders for barges of 800 to 1,000 tons, both in Germany and abroad, for use in transporting German goods to states bordering on the Danube. It is also reported that a shipbuilding firm of Budapest is working to full capacity on orders for Roumania and Czecho-Slavakia, for whom twelve barges and four cargo steamers are said to have been completed during last summer. The opinion is expressed that the Stinnes group will shortly have a fleet of ships on the Danube.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, eNw York

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A reader of these articles writes me that he finds them discouraging because they tell so glibly of the millions raised for corporations and governments in the money markets of the world, while he finds it so difficult to borrow the few thousands that he needs in the conduct of his business.

I sympathize with him for I well remember how angry I was when as a young man in business in a small city I read of the low rates at which the money, for which I was paying usuriously, seemed to be lending in New York. But with experience I came to understand that there is properly a wide difference between the rate at which money can be borrowed in large amounts on security that is instantly convertible, and the charge made for loans that are either unsecured or secured by collateral which though its value is undoubted cannot be sold by telephoning the Stock Exchange, as can stocks and bonds.

Only last week an old friend sent me a considerable sum requesting that I should invest it "safely." Although I generally decline such requests I could not refuse this one and being anxious to put the money where it would be absolutely secure I suggested a farm mortgage or a loan upon improved real estate in a growing city, than which no investment is in my opinion safer. The suggestion was instantly rejected by my friend, who insisted that he wanted a security that he could sell without trouble whenever he wanted his money back.

Interest Rates

I tell of the incident to explain the disparity in interest rates so much complained of just now. In all the larger money markets of the United States, as well as those of England, Holland, and some other countries, there is now much capital that is seeking a semi-liquid investment. Its owners will not lend it on real estate or merchandise because such loans are not quickly convertible; nor will they buy commercial paper because they cannot get their money back until the paper matures. The community is therefore dependent upon the banks or the limited few who specialize in lending on unsecured or slow security for the credit that commerce and agriculture require, and as the supply of such funds is relatively restricted the market rate for them is correspondingly high.

As the convertible investments are absorbed the return from them declines and investors who desire a higher rate of income are gradually compelled to accept securities or loans which, though perfectly good, cannot be so quickly resold. To bankers all this is trite and it is written not for them, but to allay the widespread discontent that is plainly evident among many otherwise well-informed business men who feel that they are being unjustly dealt with.

During the week ending last Saturday the redistribution of the world's unemployed capital has proceeded apace. In all the major financial centers the demand for investment securities has been enormous. In Paris people stood in line all night that they might have a chance at a new issue of Paris Lyons & Mediterranean Railway securities that was enormously oversubscribed; and in London, Amsterdam and New York the market for both new and seasoned securities of the first-class seemed almost insatiable.

This somewhat sudden revival in the demand for bonds and high grade stocks may be due in part to the accumulation of investment funds while buyers hesitated in fear of a bonus bill that would necessitate a huge government loan; but for the most part it reflects the release of capital hoarded by the timid who are now becoming bolder as the world seems to be gradually finding itself again. In time the money thus put in circulation will reach the remoter fields of agriculture and industry, and the disparity in interest rates will not be so great.

This is the classical sequence always to be observed during a period of business recovery but in the present instance it will be somewhat hastened in the United States by our continued accumulation of gold. The supply held by the Federal Reserve Banks increased another $5,000,000 last week, despite which the reserve ratio dropped 1.4 per cent to 76.7, chiefly because there was an aggregate gain of $71,000,000 in circulation and deposits.

The developments of the week were not otherwise important. The coal strike set for April 1 still threatens, but the threat seems to have lost its terror. A few of the markets have been reactionary but none of them have shown any weakness. Some of the speculators who had substantial profits in their holdings of stocks, wheat, corn, cotton, etc., have been realizing but their offerings have been well taken and the position in each case has probably been strengthened by the redistribution. Sugar, is however, one commodity that has advanced and granulated is now up to 5.20, at which price the quantity for sale is relatively small. Coffee has been somewhat easier upon a report that the Brazilian government has determined to abandon "valorization" because it was no longer necessary. This is probably true and if the artificial support hitherto given coffee is withdrawn, higher prices are likely when the market is left to itself. Copper is a shade steadier and continued improvement in the demand for and output of iron and steel is reported. It is attributed chiefly to the railroad buying, but an improved inquiry from building contractors is also to be noted.

Cotton and wool have been quiescent at previous levels. There is nothing new in either market, but the fertilizer companies say they can sell all the cotton fertilizer they are willing to put out on credit. The trade is now prepared for a crop of 10,000,000 bales this year and present prices are predicated upon the expectation of that yield. The jobbing trade is good but the full effect of the advance in wheat and corn upon the farmer's purchasing power will not be felt until April or May when buying for the fall trade commences.

Railroad traffic is gaining and some officials predict a car famine this summer.

Foreign Exchange Market

In the foreign exchange market sterling and francs have maintained the advance of last week, and sterling at one time sold as high as 444¾, but marks fell to .41 upon a statement showing that there were 116,280,969,000 paper marks outstanding as of Feb. 23. Swiss francs are selling at 19.58, which is slightly over their gold value 19.3. This due to the accumulation of German capital in Zurich and Berne where taxes are low. The result is a great plethora of money in Switzerland and the bank rate has been reduced to 3½ per cent, while good bankers acceptances are selling in Zurich at 2 per cent.

The proposal to pass a bonus bill that would make most of the soldiers borrower and be chiefly a bonus to the pawn brokers need not be seriously considered. It is already killed by ridicule.

The State of Missouri has, however, just sold $15,000,000 of its bonds, the proceeds of which will be distributed among the soldiers enlisted from that state. It is probable that at least $300,000,000 will have been disbursed among the soldiers by the various states before the summer is over.

Great opposition to the ship subsidy is developing among those who maintain that it is inconsistent to refuse the soldiers a bonus and give one to the ship owners who compose a much smaller and less necessitous class. It is also pointed out that the proposed subsidy will cost more than will be obtained for the ships whose sale it is expected to facilitate and that we would save money by giving the ships away.

This leaves an appeal to our pride in an American merchant marine and its national utility as the only arguments in favor of the subsidy. The issue will not be decided in a hurry and a weary Congress is meantime considering an adjournment which if taken will probably be the signal for an instant and widespread resumption of business activity. The stage is set, the actors are ready and the fear of Congressional interference or foolishness is the chief reason why the performance is not already in progress.

Engineering and Civic Bodies Pay Honor to Ericsson and De Lamater on Anniversary of "Monitor-Merrimac" Battle—Four Bronze Tablets Unveiled in New York

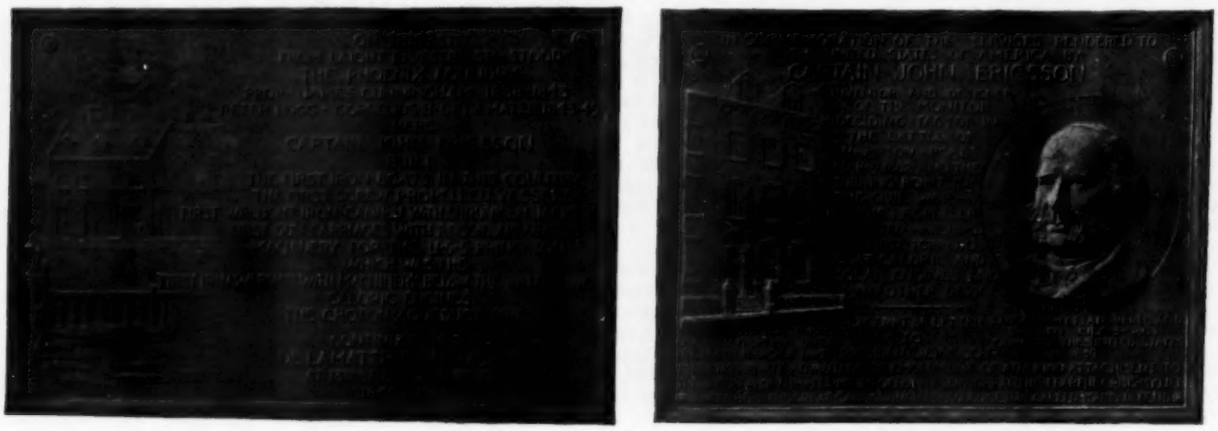
The sixtieth anniversary of the battle between the "Monitor" and the "Merrimac," was celebrated on March 9 by the unveiling of four bronze tablets in honor of the two men who built the vessel that won the famous naval battle of the Civil War. The ceremony was arranged by the DeLamater-Ericsson Commemoration Committee, composed of representatives of various engineering and civic organizations in New York.

The tablet shown on the right was set up at Captain Ericssons' old home at 36 Beach St., New York City, and was unveiled by representatives of the American Society of Swedish Engineers. The one shown on the left was placed upon the site of the Phoenix Foundry, where much of Captain Ericsson's early work was done. This ceremony was conducted by the General Society of Mechanics and Tradesmen.

Of the two other tables, not shown here, one was unveiled by the Associated Veterans of the De Lamater Iron Works, on Cunard Pier No. 54, at the foot of West 30th St., New York City, the site of the old De Lamater Iron Works; the other was unveiled at the Continental Iron Works, West Calyer St., Brooklyn, N. Y., by Thomas F. Rowland, president of the works.

The tablet on the Cunard pier was accepted by Mayor Hylan for the city of New York, while the others were accepted by Dr. George F. Kunz, for the American Scenic and Historic Preservation Society.

In the evening, a banquet was held at the Waldorf-Astoria Hotel, at which representatives of the United States and the Swedish governments, of various historic, civic and technical organizations, and ordnance, shipbuilding and shipping interests were present. The diners were in communication by cable with a simultaneous banquet in Stockholm, Sweden, at which members of the Royal family and the American minister and consul did honor to the memory of Ericsson and De Lamater.



TWO OF THE TABLETS UNVEILED IN MEMORY OF CAPTAIN JOHN ERICSSON AND CORNELIUS H. DE LAMATER

Foreign Trade Council to Study Export Problems at May Convention

Americans engaged in foreign trade or connected with any factor of our international commerce, agricultural, commercial, industrial, financial or transportation; all chambers of commerce, boards of trade, national and state associations and other commercial and industrial organizations, as well as firms and individuals, are invited to participate in the ninth national foreign trade convention, to be held in Philadelphia on May 10, 11 and 12, under the auspices of the National Foreign Trade Council.

A feature of the three-day conference will be the trade adviser service. This service is intended to provide information on any foreign trade problem and to give advice as to how best to handle the problem. A special delegation of government experts, consuls, commercial attaches, trade commissioners, economic and statistical experts will be at the disposal of the delegates.

A few of the vital subjects that will be discussed have just been announced. The financing and expansion of foreign trade will be the main topic. It will be studied from every point of view by leaders in commerce, industry and finance. They will seek the solution of the problems of unemployment and the stagnation of business. One of the principal topics of the first day's meeting will be "A Foreign Loan Policy That Will Enable Our Idle Factories to Get Work."

"The Merchant Marine, an International Problem," is another of the major subjects that will be studied at this meeting. Another interesting transportation topic will be "Inland Waterways as Developers of Traffic." Other topics will be: "A Practical Method of Putting Our Surplus Gold to Work in Financing Foreign Trade;" "The Exporter's View of the Present Attitude of Banks Toward Foreign Trade;" also the bank's view of this latter question. Taxation, exchange rates, sales promotion and advertising will also be given some attention.

Arrangements for attending the convention can be made with the secretary, O. K. Davis, at 1 Hanover Square, New York City.

Baltimore To Have Vocational Training School

Plans are being made by the board of school commissioners, Baltimore, Md., to establish a part-time vocational training school which will be attended by employees of Industrial plants for one or two sessions each week. A number of the plants are supporting the plan, including the Baltimore Car Works, Curtis Bay Copper and Iron Works, Davison Chemical Co., U. S. Alcohol Co., U. S. Industrial Chemical Co., Prudential Oil Co., Maryland Car Wheel Works and U. S. Asphalt and Refining Co.

Westinghouse Makes Changes in Personnel

Several changes in personnel have been announced recently by the Westinghouse Electric and Manufacturing Co., of East Pittsburgh, Pa. Among them are transfers of various managers in the district offices.

R. L. Rathbone, branch manager of the Cleveland office, will take up special duties in connection with merchandising matters, with headquarters in Cleveland.

J. Andrews, Jr., manager of the industrial division, Pittsburgh office, has been appointed manager of the Cleveland office; C. D. Taylor succeeds Mr. Andrews in the Pittsburgh office.

R. Seybold has been appointed manager of price statistics. He will also act as secretary of the domestic sales committee and will assist W. S. Rugg, assistant to the vice-president in general duties connected with the vice-president's office.

W. R. Keagy has been appointed office manager of the Cincinnati office; and J. R. Deering, office manager of the Los Angeles office.

H. S. Walker succeeds M. E. Lanning as promotion manager in the Denver office, and I. G. Cline takes up the promotion work vacated by R. A. O'Reilly in the Chicago office. K. L. Graham succeeds H. C. Hopkins as promotion manager in the San Francisco office.

GTD Code To Simplify Telegraphic Orders

A carefully compiled and comprehensive telegraph and cable code has just been published by the Greenfield Tap and Die Corporation, of Greenfield, Mass. Although the code was originally intended for the company's overseas customers, it is equally suited for its domestic trade and is expected to prove a means of reducing the cable and telegraphic expense of those who have occasion to order goods by wire.

The code as now published represents several years of work in classification of cables sent and received by the home office. It is a five-letter code, and so arranged that it can be combined with the majority of standard commercial codes. The technical nature of many GTD products makes it impossible to economically describe them by any standard code.

This new GTD code covers every item of manufacture, quotations and financial matter; also exchange, technical terms of the trade, etc.

The code is included in the new No. 46A catalog just issued by the Greenfield Tap and Die Corporation and copies may be obtained from the home office.

Detroit Letter

The Paige-Detroit Motor Car Co. is working on a production schedule calling for the building of 13,170 cars during the first six months of 1922. Seven thousand of these will be Paige models, while the remainder will be the new light-six Jewett model. If this schedule is met it will mean the shipment of 4,000 more cars during that period, than were shipped during the entire year of 1921.

The King Motor Car Co. is reported to have received foreign orders from England and Belgium, which call for several carloads of King models. Local orders are also increasing, dealers in Erie, Pittsburgh and Cleveland having doubled their quotas. President Weber states that King will produce 7,500 cars this year, instead of the contemplated 2,500.

The new Kess-Line car will be on the market by June 1. The car will be built in the old Liberty plant in Detroit, and officials of the company state that orders are now being booked up to capacity. The new car will be built from the Kessler patents. The motor, a four-cycle machine with eight small cylinders is said to embody some new and interesting features, among which are less piston displacement, low fuel consumption and absence of carbon deposit in the cylinders. Tests recently conducted in Detroit were entirely satisfactory. The new car, fully equipped, will be marketed around $2,000.

American Machine & Foundry Co. To Make Gurney Elevators

The American Machine and Foundry Co., of Brooklyn, N. Y., has acquired a substantial interest in the Gurney Elevator Co., of New York. It it understood that hereafter Gurney elevators will be manufactured in the plant of the American company, in Brooklyn.

This arrangement was brought about to provide increased manufacturing facilities for the Gurney company.

Steel Treaters Hold Sectional Meeting in New York

The American Society for Steel Treating has inaugurated a new plan by which sectional meetings are held under the auspices of one of the sections or chapters, as they are called. This gives the members in different localities, who may perhaps be unable to attend the annual or semi-annual meetings, an opportunity to keep in touch with the work of the society and of the members. These local meetings are really a part of the work of the society as a whole.

The first of these sectional meetings was held on March 3, in New York, at the Hotel McAlpin, and was well attended by members from a radius of 250 miles. I. H. Cowdrey, chairman of the Boston Chapter and instructor of mechanical engineering at the Massachusetts Institute of Technology, presided.

Among the papers presented were those by E. J. Janitzky on the influence of mass in heat treatment; G. R. Brophy on a new heat-resisting alloy called "calite"; R. G. Hall on stainless steels for use in cutlery and similar articles; V. E. Hillman on cold-headed bolts, their metallography and heat-treatment, A. V. de Forest on magnetic testing of small case-hardened chain, and J. H. G. Williams on perfecting a drop forging. Extracts of some of these papers will appear in coming issues.

In nearly every case the papers evoked extended discussion from the floor and the keen interest shown in the various subjects augurs well for the future of the society. Many lines of manufacture were represented and there was every indication that the sectional meetings are bound to be a success. An informal dinner followed the meeting and aided in bringing the members and guests into closer contact.

Machinery Wanted for Guatemala Industry

It is reported that a company has been formed in the Republic of Guatemala with the object of establishing plants for the manufacture of jute fabrics, gunny sacks and allied products. Those interested should address the Central and South American Export Company of Guatemala, Guatemala, Central America.

Machinists' Union To Present Bill to Congress

Officials of the International Association of Machinists are at work on a bill, to be presented to Congress as soon as possible, which is designed to provide relief for the thousands of navy yard employees who were thrown out of work on account of the cessation of work due to the provisions of the armament conference.

The bill provides that all work of the government departments which can be done in the navy yards and arsenals, be allocated to them instead of to private firms. Its aim is to keep the government navy yards and arsenals in operation and thereby provide employment for the thousands of workmen who are now idle because the yards are closed.

Taylor Society Meeting in Philadelphia

The mid-winter meeting of the Taylor Society will be held at the City Club, Philadelphia, on March 16, 17 and 18. A preliminary program has been arranged which includes some interesting subjects for discussion. Some of the papers scheduled for presentation are: "A Case of Sales Research," by John M. Holcombe, Jr., manager sales research division, Phoenix Mutual Life Insurance Co., Hartford, Conn.; "Problems of General Management," by Henry P. Kendall, Boston; "Super-Standards," by Frank B. and L. M. Gilbreth, Montclair, N. J.; "Budget Control," by George E. Frazer, Frazer & Torbet, Chicago; "Mills, Minds and Men," by Arthur Pound, Flint, Mich.; "String-Board Graphics," by Percy S. Brown, works manager, Corona Typewriter Co., Groton, N. Y.; "The Work of the Balance of Materials Clerk," by Thomas W. Mitchell, Philadelphia.

Chicago Letter

Inquiries and general interest in the iron and steel products market during February indicate a considerable improvement, but actual business placed was disappointing. Machine tool dealers report a continued increase in the amount of inquiry, and although large business has been noticeably absent, February has been a good month, considering the aggregate of small buying.

Much truth is seen in the statement that mechanics out of work are combining their interests and starting small shops for which they are seeking equipment, also that in most cases they have little resources and expect more credit than can be extended.

The machine tool employment situation in this section of the country compared with that of last year this time shows a decrease of about 39.5 per cent.

Railroads, which are now in the midst of a program of car purchasing and are the most active buyers of steel, continue to stay out of the machine-tool market and although much hope has been placed upon their activities in this line, it is thought that because the greater part of their car repairing is being done in outside shops, they will not buy tools heavily for some time. However, the Santa Fe continues to make additional purchases from its outstanding list from time to time, and the most recent machines purchased by them were a 48-in. x 48-in. x 12 ft. planer and a 15-ton overhead traveling crane. The C. B. & Q. R.R. is preparing a large list which is expected to be issued shortly. The Rock Island has done nothing with the large list issued some time ago.

There is a noticeable demand for additional manufacturing space. The National Phonograph Company has leased from the Hoffman Company for ten years the three-story factory building containing 30,000 sq.ft. of floor space, located at 2837-47 North Ashland Ave. This company also purchased $15,000 worth of woodworking machinery from the Hoffman Company. The Bassick Manufacturing Company, makers of automobile accessories, purchased the manufacturing plant at the southwest corner of Crawford and Shubert Avenues, for $260,000.

Prize for Glider Test in Germany

German aviation interests have offered a prize of 100,000 marks for a test flight in a motorless airplane. This type of air vehicle has attracted great interest in Germany of late and the contest has been arranged to stimulate further improvement in design.

The prize will be awarded only if the successful competitor remains in the air forty minutes, returns to the starting point and after recrossing the starting line between two marks one hundred meters apart completes the flight with a five-kilometer straightway flight.

Business Items

The Whiting Corporation, Harvey, Ill., has established its own branch sales office in New York City, at 136 Liberty St. This company was formerly represented by the Wonham, Bates & Goode Trading Corporation. J. R. Bates, is in charge of the new Whiting offices. The Whiting company has also opened offices at 305 Merchants' Bank Bldg., Indianapolis, Ind., in charge of J. E. Stout.

The Sebastian Lathe Co., of Covington, Ky., has been incorporated under the laws of the State of Ohio, with a capital of $100,000. The incorporators are: E. E. Stokes, Clara E. Sebastian, Ethel S. Stokes, Frank H. Kunkel and Dorothy Sebastian.

The Syracuse Metal Products Co. and the Colonial Machine Co., both of Syracuse, N. Y., have been merged in a company to be known as the Colonial Metal Products Co. This company will make special tools and machinery. E. A. Klein has been elected president; Henry McCarthy, first vice-president; William F. O'Donnell, second vice-president; John F. Moran, treasurer; D. O. Macken, secretary.

The Midwest Engine Company, Indianapolis, Ind., is being reorganized and will shortly apply for incorporation privileges. The company is now running on a reduced operating schedule.

The Franklin Tractor Co., of Greenville, Ohio, was sold in a bankruptcy sale on Feb. 21. H. E. Bullock, of Chicago, was the purchaser.

Officials and superintendents of the Aluminum Company of America held a five-day conference from Feb. 21 to 25 at Massena, N. Y. Among those present were fourteen officials from subsidiary branches of the parent company.

Directors were re-elected at the annual meeting of the stockholders of the Youngstown Sheet and Tube Co., Youngstown, Ohio, as follows: John L. Severance and George L. Cameron, Cleveland; J. A. Campbell, Richard Garlick, A. E. Adams, E. L. Ford, J. G. Butler, Jr., Robert Bentley and C. H. Booth, all of Youngstown. The board organized by electing the following officers: President, J. A. Campbell; first vice-president, H. G. Dalton; vice-presidents, C. S. Robinson and W. E. Manning; treasurer and assistant secretary, William J. Morris; secretary and assistant treasurer, W. E. Meub; comptroller, W. N. McDonald.

The stockholders of the Hadfield-Penfield Steel Co., Bucyrus, Ohio, at the annual meeting re-elected the board of directors as follows: R. C. Penfield, of New York; L. W. Penfield, of Willoughby, Ohio; H. A. Gillis. of Washington, D. C.; R. E. Crane, of New York, and W. E. Parker, of Sheffield, England. The board of directors will meet later and elect officers.

The executive offices of the Willys-Overland Co. will be moved from New York to Toledo, Ohio. This announcement was made last week by John N. Willys, president of the company.

The Oldroyd Machine Co. has been incorporated in Delaware for $250,000 and has acquired the property of the Oldroyd Mining Machine Co., in Cincinnati, Ohio.

The Associated British Machine Tool Makers, Ltd., London, England, have appointed the A. R. Williams Machinery Co., Ltd., of Toronto, Canada, as their sole agents in Canada.

The Birmingham Steel Corporation, Birmingham, Ala., has been sold to the United States Shipping Board. The sum involved is said to be $130,000. The plant was used during the war to manufacture fabricated steel for shipbuilding.

The H. H. Franklin Manufacturing Co., Syracuse, N. Y., will issue stock to the amount of $5,000,000. Half of this amount will be spent on plant and equipment and the other half in financing the new four-cylinder Franklin car.

At the annual meeting of the stockholders of the Gilliam Manufacturing Co., of Canton, Ohio, the following officers were elected: B. T. Steiner, president; P. K. Davis and G. L. Miller, vice-presidents; W. H. Steiner, treasurer; S. G. Zimmerman, secretary. The company manufacturers roller bearings.

The Murphy Die Co., Worcester, Mass., has recently been incorporated under the laws of Massachusetts, to manufacture dies for gaskets, etc. John F. Murphy, is president; John W. Murphy, vice-president; W. L. Hubbard, secretary and treasurer. The new concern is a consolidation of the Greendale Manufacturing Co., of Worcester, and the John F. Murphy Co., also of Worcester.

At the annual meeting of the Automatic Machine Co., manufacturers of automatic machinery, etc., Bridgeport, Conn., the following officers were elected: Frederick J. Kingsbury, president; James Coulter, vice-president; Alfred J. Porter, secretary; Norman Leeds, treasurer and general manager. Directors chosen were: F. J. Kingsbury, Henry A. Bishop, M. F. Burns, William E. Burnham, William R. Webster, Norman Leeds, James Coulter, Stiles E. Goodsell.

The general sales department of the Gilbert & Barker Manufacturing Co., Springfield, Mass., recently announced the following additions to its sales force at the Los Angeles, Cal., district sales office: T. J. Lockhard, W. B. Levings and R. H. Kerns.

The Fabric Machine Co., 307 Center St., Bridgeport, Conn., has recently been incorporated to take over the machinery manufacturing plant of the A. L. Adams Estate, of the same address. The capital stock is $50,000. The incorporators are Joseph J. Musante, Clifford J. Lewis, Arthur E. Bromley and Arthur Sullivan. The company manufactures fabric machinery, such as cloth cutting and winding machines.

The city of Holyoke, Mass., has awarded the contract for the electric hoist and machinery in the new municipal lighting department, to the Shepard Electric Crane and Hoist Co., of Montour Falls, N. Y.

The Wallingford Plating Co., Inc., of Wallingford, Conn., recently filed a certificate of incorporation under the laws of Connecticut, to engage in buffing and plating metals, etc. The capital stock is $10,000; the incorporators are Charles J. Benham, 48 Academy St.; R. L. Del Rosso and Charles A. Gardner, all of Wallingford.

The Dale Machinery Co., Inc., announces the removal of its executive and sales offices from 54 Lafayette St., to 17 East 42nd St., New York City.

Personals

E. G. ALLEN, formerly engineer with the Westinghouse Electric and Manufacturing Co. at So. Philadelphia, has joined the engineering department of the Philadelphia Electric Co.

W. C. BRUMBLE, equipment engineer for the Durant Motors Co., Long Island City, N. Y., has accepted a similar position in the plant production and engineering department of the Chevrolet Motor Co., Detroit, Mich.

C. M. DAVISON, who has been connected with the Poole Engineering and Machine Co., Baltimore, Md., as general superintendent, has been appointed assistant vice-president of that company.

THOMAS F. DUPUY, formerly superintendent and manager of the General Drop Forge Co., Buffalo, N. Y., is now general manager of the newly incorporated Canton Forge and Axle Co., which has purchased the forging plant in Canton, Ohio, formerly owned by the Standard Parts Co. of Cleveland.

REAR ADMIRAL R. S. GRIFFIN, U. S. N. (retired), formerly engineer-in-chief, of the United States Navy, announces that in association with COMMANDER WILLIAM L. CATHCART, U. S. N. R., he is now prepared to undertake consulting work in marine and naval engineering. Their office is located in New York City.

MARK S. JAMES has resigned his position as engineer of rolling mill sales, Birdsboro Steel Foundry and Machine Co., and has become second vice-president of the Treadwell Engineering Co. at Easton, Pa.

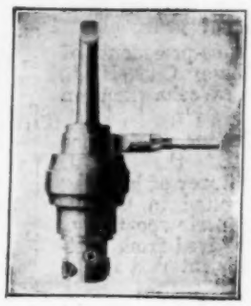
EDWARD C. MAGDEBURGER, who was for many years associated with Busch-Sulzer Bros. Diesel Engine Co., St. Louis, Mo., and was lately chief engineer of the St. Marys Oil Engine Co. of St. Charles, Mo., is now connected with the Navy Department as an aide on Diesel engines in the Bureau of Engineering at Washington, D. C.

W. J. MAGUIRE, formerly eastern district sales manager for the Pacific

Condensed-Clipping Index of Equipment

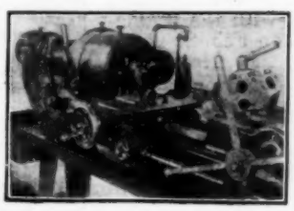
Patented Aug. 20, 1918

Tapping Device, Friction, Jarvis
Geometric Tool Co., New Haven, Conn.
"American Machinist," October 13, 1921.



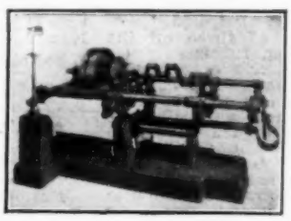
The device is intended for use when tapping small holes in tough metal, its purpose being to prevent the breakage of taps and the stripping of threads. It is provided with a friction cone, at which point slippage can take place in case the tap should become lodged in the work. The driving force is controlled by the pressure placed on the spindle of the machine. The tap itself can be started and stopped while the spindle is rotated. The device has a tapping range up to ¼ in.

Lathe and Screw Machine, Tilted Turret, Power Crossfeed
Wood Turret Machine Co., Brazil, Ind.
"American Machinist," October 20, 1921.



A power crossfeed to the cut-off slide has been developed for the Nos. 2, 3, 4, 5 and 6 tilted turret lathes and screw machines. The single-lever control allows of feed engagement in either direction. Six feed changes, ranging from 0.003 to 0.023 in. per revolution of the spindle are provided, any feed being instantly available without stopping the machine. The bronze feed nut is of the solid flanged type and is held in place by two capscrews. Positive screw stops are mounted at the front and rear to control the depth of the cut when using forming tools.

Balancing Machine, Crankshaft
Precision Balancing Machine Co., 3020 E. Franklin Ave., Minneapolis, Minn.
"American Machinist," October 20, 1921.



The machine gives complete dynamic and static balance by two single corrections, individually measured and located near the ends of the body. A spring-mounted and pivoted frame carries a special type of headstock and adjustable rollers to support the work. All revolving parts are mounted on ball bearings. As a critical speed of about 100 to 110 r.p.m. is said to give the best results, the machine can be manipulated by hand or by an electric motor suitably mounted. The machine is adapted to balancing automotive crankshafts, flywheels, and parts readily mounted on arbors. It will receive bodies up to 24 in. in swing and 32 in. between bearings.

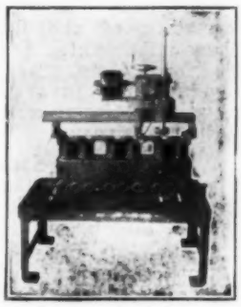
Instrument, Timing and Signaling
Stromberg Electric Co., Chicago, Ill.
"American Machinist," October 20, 1921.

This electrically operated timing and signaling instrument is intended chiefly for timing the length of a process. It is for use in all manufacturing processes where the element of time is a factor, such as in the heat-treatment of steel, enameling, plating and etching. The mechanism consists of an electric motor and gearing. The instrument will indicate the total length of a process, the length of time a process has been in operation, and how much longer the process is to continue; and then automatically operate the signal when the process is completed. The signal, which may be either a bell, a light, or both, will continue to operate until stopped by the person in charge. Weight 9 lb.

Drilling and Boring Machine, Light Heavy-Duty, No. 121
Baker Bros., Toledo, Ohio.
"American Machinist," October 20, 1921.

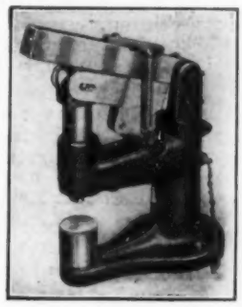
The machine is intended for driving drills from ⅜ to 1¼ in. in diameter, as well as for such work as boring and facing. It can be furnished as either a single-purpose or a quick-change drilling machine, the former lacking the gearing of the latter. The machine can be furnished in gangs with a dimension of 18½ in. between the spindles. It is stopped and started by means of the tight and loose pulleys, a spring device holding the belt in place. Various attachments and modifications can be provided, such as a tapping reverse, multiple-spindle head, motor drive and oil pump. Floor space, 22 x 36 in. Weight 2,100 lb.

Boring Machine, (Re-), Cylinder, Portable
Bridgeport Cutter Works, Inc., 50 Remer St., Bridgeport, Conn.
"American Machinist," October 20, 1921.



The machine is electrically driven and portable; it is said to be adapted to all makes of automobile cylinders, and to be very speedy in its operations. It consists essentially of a sliding head supported on a guiding way that is carried on the top of the cylinder block by means of suitable brackets. Provision is made for adjusting the way in line with the center of the cylinder. The head carries a cutter bar, and a clamp is provided for supporting the head close to the point where the cutter is working. The bar is driven at slow speed through reducing gearing, by means of an electric motor connected to a lighting circuit. The cutter employed consists of two herringbone cutters, the teeth of which are staggered.

Staking Machine, "Trip-Hammer"
H. C. Giles Corporation, 303 Cox Bldg., Rochester, N. Y.
"American Machinist," October 20, 1921.



The machine is intended for staking cupped or drilled rivets, studs, screws, and other small screw-machine products. It can be mounted on a work bench or on a separate pedestal. It is actuated by the foot of the operator, a rod extending through the base to the treadle. The spindle houses the hammer and the pad carrying the staking set. By a suitable mechanism, the bar at the top of the machine serving as a hammer is tripped when the staking set has been brought to position.

Universal Joint
Borgeson Manufacturing Co., Torrington, Conn.
"American Machinist," October 20, 1921.

The sockets of the joint are of cold-rolled steel milled from the solid bar, while the working parts are of carbonized and hardened milled steel. The "ball" is a cube with the corners rounded, and is made in two parts, held together by a bolt, nut and cotter pin. The pins upon which the ball swivels are driven into the wings of the sockets, and are staked in place. The bearing surfaces of the pins are tapered, and each pin has a small head or shoulder to preclude the possibility of its working loose. To compensate for wear, the bolt is withdrawn and the flat mating surfaces of the two parts of the ball are ground slightly.

Coast Steel Co., is now in the sales department of the Linde Air Products Co., New York City.

PROFESSOR EDWARD F. MILLER, head of the department of mechanical engineering at the Massachusetts Institute of Technology, has been made a colonel in the Ordnance Reserve Corps, U. S. A., in recognition of the work he did for the government during the war. Professor Miller invented the steam driven tank which was later replaced by gasoline driven tanks, and he organized many schools for training marine engineers under the Shipping Board.

F. E. ROGERS, in addition to his work as publicity manager for the Davis-Bournonville Co., Jersey City, N. J., is now proprietor of the Rogers Machine Co., and president of the Service Engineering Co., New York City.

JOHN A. STEVENS, power plant specialist of Lowell, Mass., is at present abroad, making a review of recent developments in power plant engineering in Egypt, Italy, France, Switzerland and England.

STILLMAN SHAW announces the formation of the firm of Stillman Shaw & Associates, Inc., with offices in Hartford, Conn., for the practice of general consulting engineering, specializing in the design of special and automatic machinery.

C. A. TONNE, formerly with the Niles-Bement-Pond Co., Rochester, N. Y., is now with the Tonne Re-Grinding and Machine Co., Cincinnati, Ohio.

CHARLES B. WILSON, formerly vice-president in charge of operations of the Willys-Overland Company, has been appointed general manager of the Willys-Overland and associate companies.

GEORGE W. ATKINSON recently joined the Gilbert & Barker Manufacturing Co., Springfield, Mass., as superintendent of the maintenance department. Mr. Atkinson, was formerly electrical and consulting engineer at the Springfield, Mass., armory for the U. S. Government.

B. G. ROOS has resigned as chief engineer of the Pierce Arrow Motor Car Co., and has returned to his old position as chief engineer with the Locomobile Co., at Bridgeport, Conn.

MARTIN E. KERN has resigned as a director of the American Bosch Magneto Co. Mr. Kern is now traveling in Europe.

CLIFFORD EGAN succeeds his father, the late Thomas P. Egan, as president of the J. A. Fay & Egan Co., Cincinnati, manufacturers of wood-working machinery. Other officers are S. P. Egan and Fred T. Egan, vice-presidents; W. M. Green, secretary; A. A. Faber, treasurer; R. W. Egan, general manager.

J. HARVEY WILLIAMS, president of J. H. Williams & Co., drop-forge manufacturer, of Brooklyn, N. Y., has been elected president of the American Drop Forging Institute.

HENRY HARNISCHFEGER, president of the Pawling & Harnischfeger Co., of Milwaukee, Wis., is in Europe on an extended business trip. Later he expects to visit China, Japan, the Philippines, Burma, Ceylon and India. Mr. Harnischfeger will also represent the Associated Machinery Corporation, of which he is president.

Obituary

HORACE G. A. TARR, formerly vice-president of the Pullman Company and of the Otis Elevator Co., died on Mar. 2. He was seventy-eight years old.

CHARLES STUART, vice-president of Fagan Iron Works, Jersey City, N. J., died at his home in Weehawken on March 1.

HUGH JAMES MCKEOWN, eighty-one years old, founder of the H. J. McKeown Co., manufacturer of hoisting machines, formerly located in Cincinnati, died at his home in Newport, Ky., on Feb. 14. When he retired from business in 1910, he sold his interest in the company.

LOUIS F. PHIPPS, chairman of the board of directors of the American Frog and Switch Co., Hamilton, Ohio, died at his home in Cincinnati on Feb. 20. Mr. Phipps was formerly with the Globe Rolling Mill Co.

EDMUND N. SMITH, for forty-seven years treasurer of the Pennsylvania Steel Co., now merged with the Bethlehem Corporation, died on Feb. 20 at his home in Philadelphia, Pa. He was 75 years old.

WILLIAM C. GRAVES, president of the Graves Machinery Exchange, dealers in used machinery, of 50 Church St., New York City, died suddenly on Feb. 27.

Book Reviews

Tool Engineering—Jigs and Fixtures. By Albert A. Dowd and Frank W. Curtis, president and chief engineer, respectively, of the Dowd Engineering Co., New York, N. Y. First edition, 293 pages, 232 figures, 6 x 9 in., blue cloth-board covers. Published by McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y. Price $3.

The volume, the first of three on the subject of tool engineering, furnishes practical and usuable information on jigs and fixtures. It is very comprehensive, and should serve as an excellent text book or reference work. The important points of design are covered with regard chiefly to the principles involved. The details can thus be supplied or fitted to the conditions of each particular case encountered.

The illustrations give graphic examples of the principles and methods. By their use, in conjunction with the subject matter, both the theory and the practice are very well presented. The treatment of each topic is clear, concise and complete. The material is well arranged and subdivided, so that each topic is complete in itself and may be easily referred to.

The volume treats of all sorts of drilling and milling jigs and fixtures, as well as vise-jaws and broaching and riveting fixtures. Details of design and proportioning are covered. In analyzing problems, causes of trouble are shown and both correct and incorrect methods illustrated. The examples are drawn from cases encountered in the actual experiences of the writers in tooling work. The volume should be a very practical help in tooling parts for manufacturing operations, as it shows the practice that is recognized as the best and the latest in the field of tool engineering.

The Design of Steel Mill Buildings and the Calculation of Stresses in Framed Structures. By Milo S. Ketchum, C. E. Director of the Department of Civil Engineering, University of Pennsylvania: McGraw-Hill Book Co., 370 Seventh Ave., New York and 6 and 8 Bouverie St., London, E. C. Flexible covers, 650 XVI, 6¾ x 9-in. pages, sixty tables, 410 illustrations in the text and four folding plates. Price $6 net, postpaid.

This book covers the calculation of the stresses in framed structures and the design of buildings having self-supporting steel frames. In this, the fourth edition, the book has been rewritten and enlarged, the type reset and the plates recast. Some of the new matter covers a concise discussion of the calculation of the stresses in statically indeterminate trusses and frames, several problems in framed structure, and detailed designs of a crane girder, a roof truss and a mill building having a steel frame.

The book is divided into three parts and an appendix.

Part I covers the calculation of stresses in simple beams, trusses, portals, etc., and contains forty problems.

Part II covers the calculation of the deflections of structure; stresses in girders, trusses and frames. This part also contains data on problems in building construction and is preliminary to a study of bridges of the movable, arch, cantilever and suspension types.

Part III covers the design and construction of steel-framed buildings for various classes of industrial plants, also a full discussion of the design and construction of floors, roof coverings, foundations, windows, doors and other details.

The appendix contains a complete specification for a steel-framed mill building.

The author is to be congratulated for the clear manner in which he has treated his subjects. While the book was orginally written for the use of students, engineers of experience will find in it much matter of interest, especially in the demonstration of theories to young assistants.

Forthcoming Meetings

Taylor Society: Mid-winter meeting, Philadelphia City Club, Philadelphia, Pa., March 16, 17 and 18. Secretary's headquarters, 29 West 39th St., New York City.

National Metal Trades Association: Annual convention April 17 to 20, Hotel Astor, New York City. H. W. Fisher, 1022 Peoples Gas Building, Chicago, Ill., secretary.

American Gear Manufacturers' Association: Sixth annual meeting, Buffalo, N. Y., April 20 to 22. Secretary, F. D. Hamlin, 4401 Germantown Ave., Philadelphia, Pa.

Southern Supply and Machinery Dealers Association: Annual meeting, Birmingham, Ala., April 24 to 26. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, A. M. Smith, c/o Smith-Courtney Co., Richmond, Va.

National Research Council: Annual meeting of executive board, April 26, Washington, D. C. A. D. Flinn, 29 West 39th St., New York City, chairman.

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 12. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

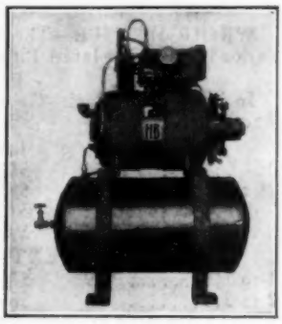
American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Compressor, Air, Automatic
Hobart Bros. Co., Troy, Ohio
"American Machinist," October 20, 1921



The unit is especially intended for use in garages and service stations where it is necessary to keep a constant pressure in the air lines. The device is compactly made, the compressor unit being mounted on top of the supply tank. The pump is of the rotary type and driven directly from the motor, which is mounted on the same shaft. No gears are employed and the shaft runs on ball bearings, so that the unit is quiet in operation. The magnetic pressure release enables the motor to start without load. An air and oil filter, safety valve, gage and tank are standard equipment.

Tapping Machine, Automatic, "Hy-Speed"
Cincinnati Hy-Speed Machine Co., Cincinnati, Ohio
"American Machinist," October 27, 1921

The machine has a patented spindle lead and automatic reversing mechanism. With the use of the spindle-lead device, the tap is brought forward and returned in a positive way, without the necessity of attention from the operator. One half turn of the stop plunger at the side of the control handle changes from semi-automatic to fully automatic operation. The spindle can be stopped at any point, reversed, and again brought forward by the use of the control lever. Adjustable dogs on the trip rod regulate the depth of tapping. S.K.F. ball bearings are used throughout. The machine is built with from one to three spindles in two sizes, the maximum capacities being ¾ and ⅝ in. in steel.

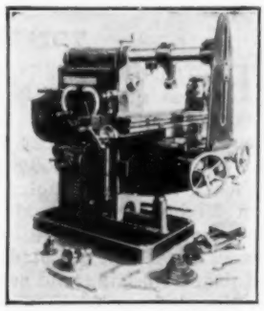
Dresser, Grinding-Wheel, Desmond-Hex
Desmond-Stephan Manufacturing Co., Urbana, Ohio
"American Machinist," October 27, 1921

The principal feature of the dresser is the fact that it provides a number of interchangeable bearings for the pin carrying the cutters. The handle is channeled on the inner sides of the head to hold removable, hardened hexagon nuts having six holes drilled partially through each. The blind holes in these nuts serve as bearings for each end of the spindle carrying the cutters. When the holes in which the spindle is running become worn, the nuts are removed by loosening the screws, and the hexagon is turned so that the next pair of holes comes into use. The dresser is made in two sizes for cutters 1¼ and 2⅜ in. in diameter.

Reamer, Expansion, Adjustable-Pilot, Piston, Critchley
Chadwick & Trefethen, 32 Bow St., Portsmouth, N. H.
"American Machinist," October 27, 1921

This Critchley expansion aligning reamer is especially adapted to the reaming of piston-pin holes in automotive-engine pistons when making repairs that involve oversize pins. The tool carries upon an extension of the body three shoes that slide in the same grooves as the blades, the shoes forming an adjustable pilot to align the reamer when entering the hole. In addition to the pilot, the upper third of the cutting blades is ground to a circle of a size to just fill the newly reamed hole, thus providing a bearing both before and behind the cutting blades. The reamer is made in ten sizes ranging from a minimum of ⅛ in. to a maximum of 1 ⅛ in., each reamer expanding 1/16 in.

Milling Machines, Constant-Speed Drive, Ohio
Oesterlein Machine Co., Cincinnati, Ohio
"American Machinist," October 27, 1921



A complete line of milling machines of the constant-speed-drive or all-geared type is made, the line consisting of Nos. 1, 2, 2 heavy, 3, 3 heavy and 4 sizes, each size being made in both plain and universal types. The No. 3 heavy-duty universal machine is illustrated. The speed-change mechanism consists of but fifteen gears, from which sixteen speeds may be obtained without stopping the machine. Automatic lubrication is effected without pumps, employing a system of three reservoirs. The operation of the machine is controlled by tight and loose pulleys. A brake for quick stopping of the spindle is incorporated in the belt-shifting mechanism.

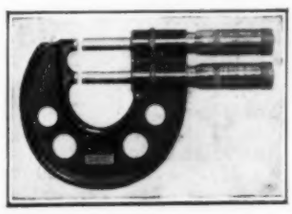
Buffing Machine, Ball-Bearing
J. G. Blount Co., Everett, Mass.
"American Machinist," October 27, 1921

These ball-bearing buffing machines are built in three sizes. The illustration shows the No. 5 machine, which is of medium size. The machine is equipped with S.K.F. ball bearings in dust-proof mountings. The bearings are secured to the spindle by light drive fits and also by locknuts. The spindle is of high-carbon steel, and a taper point is fitted to the right-hand end for use with small wheels. The head is regularly mounted with the pan on the column, the parts being bolted together.

Press, Broaching, Power, Bench
American Broach and Machine Co., Ann Arbor, Mich.
"American Machinist," October 27, 1921

The machine is operated by a 2½-in belt on a 10-in. pulley, the pulley revolving continuously in one direction. Power is transmitted through a worm and worm gear of 30-to-1 speed ratio. The ram is 2 in. in diameter with the rack teeth cut directly on the back of it. The worm automatically disengages at a predetermined point in the stroke. The return of the ram is effected automatically by means of a weight and cord. The length of stroke is 14 in. The machine is suited for operating push broaches, for pressing mandrels in and out, for pressing in bushings, and for numerous operations often performed by hand.

Micrometer, Double, Snap-Gage
J. T. Slocumb Co., Providence, R. I.
"American Machinist," November 3, 1921



The tool is in reality a micrometer with two measuring screws, each of which can be locked in any desired position. It has a range of 1 in. When the tool is used as a snap gage, the screws are set to the desired high and low limits, respectively. When used in the machining of work, it may be advantageous to set and lock the lower or "no-go" screw only. On inspecton work, the lower screw may be locked at the rejection point for minimum diameter, and the upper screw used to measure the large diameter. The frame is of forged steel.

The Weekly Price Guide

THIS WEEK'S MARKET

PITTSBURGH mill price of soft steel bars, shapes and plates quoted at $1.35@$1.40 per 100 lb. Structural shapes were quoted in October, 1913, at $1.35 and in January, 1915, at $1.10 per 100 lb., Pittsburgh. Chicago quotes steel shapes at $1.50@$1.60 f.o.b. mill. Galvanized steel sheets, base size, quoted in New York warehouses at $4.75 in 25 bundle lots and at $4.90 in smaller quantities as against $5 per 100 lb. one week ago. Openhearth spring steel (base size) quoted at 4c. as against 4¼c. per lb. Cold finished shafting and screw stock (rounds) quoted at $3.35, reduced from $3.45 and flats, squares, hexagons, etc., at $3.85, down from $3.95 per 100 lb. Pig iron shows improvement in demand; mostly small orders.

New York warehouses quote a reduction of ¾c. on tin; ¼c. on copper sheets and ¼c. per lb. on copper wire. Copper market tending toward recovery, with increased sales; zinc firmer. Reductions of ¼c. in copper sheets and rods; brass sheets, rods and tubing and 1¼c. per lb. in copper tubing quoted in Cleveland.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$20.00
Northern Basic	21.02
Southern Ohio No. 2	22.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26.26
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	20.34
Virginia No. 2	26.24
Basic	19.84
Grey Forge	20.50
CHICAGO	
No. 2 Foundry local	20.00
No. 2 Foundry, Southern, sil 2.25@2.75	22.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	20.96
Basic	19.96
Bessemer	21.46

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.00	3.75@3.90	3.75	4.15
Nos. 12 and 14.	3.10	3.85@4.00	3.85	4.25
Nos. 17 and 21.	3.40	4.15@4.30	4.15	4.55
Nos. 22 and 24.	3.55	4.30@4.45	4.30	4.70
No. 26	3.70	4.45@4.60	4.55	4.85
No. 28	4.00	4.75@4.90	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	⅜ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.96	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	3.40
Cold finished shafting or screw	3.35	3.25	3.40
Cold finished flats, squares	3.85	3.75	3.90
Structural shapes (base)	2.63	2.46	2.63
Soft steel bars (base)	2.53	2.36	2.53
Soft steel bar shapes (base)	2.53	2.36	2.53
Soft steel bands (base)	3.13	....	3.13
Tank plates (base)	2.63	2.46	2.63
Bar iron (2.00@2.10 at mill)	2.68	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅛	8.50		12@13
5/32	7.15		11@12
3/16 to ¼	6.75		10@11

High speed steel is quoted in Cleveland at 90c. per lb.

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York			13.62½
Tin, 5-ton lots, New York			30.25
Lead (up to carlots), St. Louis, 4.60; New York			5.00
Zinc (up to carlots), St. Louis, 4.77½; New York			5.12½
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	20.25	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50
Brass rods (1,000-lb. lots)	14.25	15.00	15.75
Zinc sheets (casks), (8% dis. carlots)	10.50	9.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	19.00	22.00	19.00
Babbitt metal (best grade)	32.00	41.00	36.00
Babbitt metal (commercial)	16.50	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.00	10.50
Copper, heavy, and wire	9.50	9.50	9.50
Copper, light, and bottoms	8.50	8.50	8.75
Lead, heavy	3.75	3.50	3.50
Lead, tea	2.75	2.50	3.00
Brass, heavy	5.75	5.50	8.50
Brass, light	4.25	4.00	5.00
No. 1 yellow brass turnings	5.00	5.00	5.25
Zinc	2.75	2.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	22.50	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	12.00	14.50
IC,	112 sheets	12.80	12.30	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

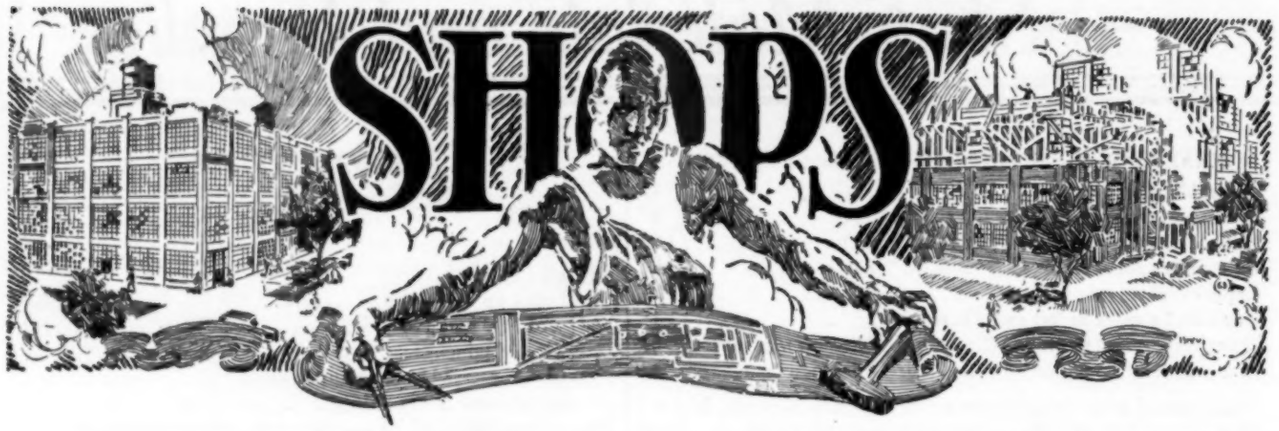
	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.13
Cotton waste, mixed, per lb	.055@.09	.09	.11
Wiping cloths per M., 13½x13½	.....	50.00	55.00
Wiping cloths per M., 13½x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.87	.99	.91
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$3.25@3.50	
Coke, prompt foundry, Connellsville	per net ton	3.75@4.25	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	60-5%	60-10%	60-10-10%
1¼ and 1¼x3 in. up to 12 in	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60%
Square and hex., head cap screws	75—10%	75%	.....
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75-10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$3.50	$3.25	$3.43
Cone heads, ditto (net)	3.60	3.35	3.53
1⅛ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	60-5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.55
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50-5%	60-10%
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	35%	40%	40-5%
Rubber and duck:			
First grade	50-10%	50-10%	.....
Second grade	60-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll	4.50	....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Ala., Bay Minette—The Bay Minette Mfg. Co., Inc., O. H. Ertzinger, Pres.—two-color veneer printing machine.

Ala., Birmingham—The Benoit Coal Mining Co., 1917 Jefferson County Bank Bldg., O. L. Davis, Purch. Agt.—small drill press suitable for drilling and reaming up to 2 in. holes.

Ala., Birmingham—S. Jacobs & Co., 234 Brown Marx Bldg., S. Jacobs, Purch. Agt.—one gyrotory crusher for limestone, capacity 50 tons per hr., and one steam shovel, 2½ yds.

Ala., Birmingham—The Tennessee Coal, Iron & R.R. Co., Brown Marx Bldg., Le Ray Holt, Purch. Agt.—steel foundry machinery of all kinds, also heavy duty lathes, Gisholts, board and steam hammers and wood-pecker hammers.

Ala., Birmingham—The Woodward Iron Co., J. T. Leonard, Purch. Agt.—one motor driven drill and reamer with flexible cord, for 1 in. and smaller drill; one lathe for company garage with attachment for thread cutting.

Fla., Chuluota—D. G. Ziegler, Columbia, S. C., purchasing architect for Petrous Mfg. Co., Chuluota—concrete mixer, brick machine, tile and roofing tile machine, elevator equipment, moulds for moulding concrete blocks, small steam shovel (new or used).

Ga., Wrightsville—The Southern Ice & Coal Co.—one 6 x 6 duplex belt driven air compressor which will lift water from deep well which has water level of about 60 ft.

Ia., Muscatine—Leu & Stein—refrigerating machinery including mechanical freezers.

Ill., Chicago—The Alto Mfg. Co., 1801 Cornelia Ave.—one No. 21 Bliss punch press or equivalent also large tumbling barrel.

Ill., Chicago—The Atchison, Topeka & Santa Fe R.R., 80 East Jackson Blvd., A. Walker, Purch. Agt.—one Atkins No. 7 power driven band saw or equivalent; one Fay & Egan No. 62 or equivalent, universal woodworking machine arranged for belt drive.

Ill., Chicago—W. J. Combs, 7524 Constance Ave.—complete set of sheet metal workers machinery, (used).

Ill., Chicago—The International Harvester Co., 606 South Michigan Ave., Purch. Dept.—one stone crusher, capacity 3 to 7 ton per hr., (used).

Ill., Chicago—F. W. Mateer & Co., 226-32 West Ontario St.—one 18 x 8 lathe, one No. 2 Universal miller and one 16 in. shaper.

Ill., Chicago—C. H. Stoelting, 3047 Carroll Ave.—bench hand milling machine, (used).

Ill., Decatur—The Builders Lumber Co., 732 North Monroe St.—woodworking machinery for proposed lumber factory.

Ill., Joliet—The Union Coal Transfer & Warehouse Co., A. Lindberg, Genl. Mgr.—ice machinery sufficient to manufacture 40 tons per day.

Ind., Evansville—The International Steel & Iron Co., 1243 Edger St.—one 2½ in. upsetting machine.

Kan., Newton—The Imperial Laundry, J. W. Morgan, Prop.—laundry machinery for proposed laundry on East 5th St.

Md., Baltimore—The Hudson Cement & Supply Co., 1802 Whitmore Ave., G. H. Haines, Treas.—concrete block machinery.

Md., Vienna—R. H. Baumgartner—mill equipment and machinery including conveyor for flour and feed mill, flour bleacher, corn meal burs, chicken feed mill, Midget Marvel mill, corn sheller, kerosene engine, etc.

Mich., Detroit—The International Mchy. Co., 2527 Grand River Ave., A. Colman, Purch. Agt.—one No. 60 Heald cylinder grinder.

Mich., Detroit—The Precision Tool Co., 5465 Lincoln Ave.—miscellaneous machine shop equipment.

Mich., Gladstone—Ludwig & Kranz—shoe making machinery, power operated.

Mich., Saginaw—The Saginaw Products Co. (motor plant), F. W. Mowbray, Genl. Supt.—machine tools, drill presses, etc.

Minn., Odessa—A. M. Semrau—lathe or turret lathe for general garage repair shop, (used).

Mo., Carthage—The Leggett & Platt Spring Bed Mfg. Co., C. B. Platt, Purch. Agt.—punch press.

Mo., Fulton—The State School for Deaf and Dumb—laundry machines for proposed laundry.

Mo., Carthage—The Pioneer Oil & Refining Co., F. B. Oswald, Purch. Agt.—oil filtering equipment.

Mo., North Kansas City—The Standard Steel Co., 1720 Tracy St.—air compressor to take care of four riveting hammers, (used).

Mo., Kansas City—E. A. Hall, 215 West 12th St., (printer)—press, 10 x 15.

Mo., Neosho—The Ozark Creamery—belting, shafting, hangers, bearings and pulleys.

Mo., Pierce City—F. Keunchel—grinding lathe, drill press, small blacksmith tools, shafting, etc.

N. J., Camden—The Standard Tank & Seat Co., 314 North Front St.—woodworking and metal working machinery.

N. J., Moorestown—The Inter State Safety Appliance Co.—woodworking machinery and stamping (metal) machinery.

N. J., Palmyra—The Palmyra News, F. Chambers, Purch. Agt.—one 6-7 Col. quarto cylinder press.

N. J., Pleasantville—The Taylor Packing Co., Pleasantville, W. Taylor, Vermont and Melrose Aves., Atlantic City, Pres.—meat packing machines also conveyors and ice manufacturing machines.

N. Y., Black River—Carpenters Bus Line Inc.—power hack saw and electric post driller.

N. Y., Boonville—The Bd. Educ. machine tools for manual training class.

N. Y., Brockport—The Wright Factory, c/o W. D. Wright—machinery for the manufacture of mission and grandfathers clocks, ladders, cabinet work, etc.

N. Y., Buffalo—The Clifton Connor Corp., 895 Niagara St.—all kinds of machinist tools.

N. Y., Carthage—The Braman Stalker Co., Inc., O. H. Braman, Purch. Agt.—woodworking equipment.

N. Y., College Point (Flushing P. O.)—The Cox Klemin Aircraft Corp., two circular wood saws; three beading machines; two rivet punches; two foot shears; one circular metal saw and two bench shears.

N. Y., Croghan—J. H. Smith—small drill press, (used).

N. Y., Henderson Harbor—J. Bassett—wood lathe and 1½ ton triple chain hoist for boat building shop.

N. Y., Mechanicsville—The Fuffney Brick Co.—machinery for the manufacture of pressed brick.

N. Y., Mechanicsville—T. C. Luther—lumber and planing mill equipment.

N. Y., New York—The Ward Baking Co., Southern Blvd.—one threading machine (bolt cutter); one 20 in. shaper; one 26 in. x 12 ft. lathe; two 18 in. stationary head drill; one 11 in. x 6 ft. speed lathe; three 16 in. four-jaw chucks; two sets Armstrong lathe tools; one No. 5, No. 3 and No. 2 emery grinders; one 24 in. jointer and one Buffalo No. 45 combination punch and shear.

N. Y., North Tonawanda—G. H. Milliman & Son, 108 Sommer St., G. H. Milliman, Purch. Agt.—wood turning lathe.

N. Y., Schenectady—The Woodcraft Mfg. Co., A. H. Scraeffer, Purch. Agt.—woodworking machinery and equipment.

N. Y., Syracuse—H. H. Franklin Mfg. Co., 302 South Geddes St., made inquiry of Pittsburgh house for list of 20 machine tools.

N. Y., Theresa—O. P. Eggleston—forge and 16 in. back geared engine lathe.

N. Y., Watertown—G. A. Aber Mfg. Co.—general equipment to manufacture gasoline motors.

N. C., Charlotte—The McClaren Rubber Co., P. O. Box 36—bench lathe, ¾ in. through collet chuck, equipped with slide rest and turret attachment.

N. C., Lexington—G. W. Smith, 310 East Center St.—self feed rip saw, jointer, band saw, cut-off saw, and sander.

O., Bedford—B. T. Wright, Village Engr.—one concrete mixer.

O., Cleveland—The Consolidated Iron Steel Co., 1290 East 53rd St.—drill press.

O., Cleveland—The Sterling Brass Co., 4612 St. Clair Ave., E. M. Collins, Purch. Agt.—ten air sweezer moulding machines; 10 in., 12 in. and 14 in. Warner and Swasey turret lathes; 10 ball bearing polishing and buffing double end machines.

O., Columbus—The Central Refractories Co., Ferris Bldg., A. N. Spencer, Vice Pres.—brick and tile making machinery, including stone crushers, presses, dryers, etc., for plant at Union Furnace.

O., South Charleston—E. P. Kelly, 1618 East Broad St., Columbus, has taken over the plant of the Houstonia Creamery & Ice Co., here—equipment for creamery and ice manufacturing including cream separation machinery.

Okla., Commerce—The Powell Cycle Lever Co., c/o A. L. Powell, Purch. Agt.—belting, shafting and drill press.

Pa., Chester—The Scott Paper Co., Market St.—additional machinery for new addition to plant.

Pa., Chester—The Textile Mfg. Co., Montgomery Bldg., D. Coulter, Pres.—general machinery for silk manfacturing including winders and cones.

Pa., Collegeville—L. Ball—one small printing press, 5 x 7 or larger.

Pa., Monessen—The Bd. Educ.—equipment for automobile shop, foundry, lathe room and woodworking department.

Pa., Phila.—The Concordia Silk Hosiery Co., A and Courtland Sts.—additional automatic full fashion hosiery machines.

Pa., Phila.—The H. B. Coyle Iron Wks., Inc., 622 Filbert St., H. B. Coyle, Purch. Agt.—additional punches, drills, etc. for new addition to plant.

Pa., Phila.—The Delphine Hosiery Mills, 3rd and Dauphin Sts., A. Strain, Treas.—automatic full fashion machines.

Pa., Phila.—The General Processing Co., Willard St. and Trenton Ave.—conveyors, shafting pulley, etc., and additional dyeing and drying machines.

Pa., Phila.—The Girard Cycle Co., 1022 West Girard Ave.—small lathes, cutters, drill and machine tools for proposed repair shop on Hutchinson and Thompson Sts.

Pa., Phila.—A. Leebovitz, 1002 North Marshall St.—fillers, conveyors and other bottling machinery.

Pa., Phila.—The McArdle & Cooney, Inc., 519 Arch St., (pipe and steam fitters supplies)—additional machinery and tools.

Pa., Phila.—The Typewriter Headquarters, 524 Walnut St.—one screw cutting lathe, about 4 ft. bed.

Pa., Phila.—W. I. Underwood, Keystone and Cottman Sts., W. I. Cottman, Purch. Agt.—additional machinery for woodworking mill.

Pa., Phila.—The S. S. White Dental Mfg. Co., Wingohocking and Unity Sts., S. S. White, 211 South 12th St., Purch. Agt.—shaftings, metal and wood machinery, conveyors, belting, etc., for new factory.

Pa., Pittsburgh—The Greenwood Constr. Co., Carson and 24th Sts., refrigerating equipment—equipment for new assembling and machine shop now under construction.

Pa., Sharon—The Salvage Arms Corp., c. A. Calleson, 50 Church St., New York City, Purch. Agt.—press and planer.

Pa., Warren—Klenck Bros.—one 14-20-in. engine lathe, shaper, drill press, emery grinder, electric drill, arbor press, bench vises, tools and all kinds of equipment for repair shop and garage.

S. C., North—E. C. Johnson—light equipment for operating short line railroad, including light locomotive, rails, switches, etc.

S. C., Olanta—The Dyson Bros. Hardware Co., W. M. Myers, Purch. Agt.—small machine for turning handles, spokes, etc.

Tenn., Clarksville—Farnsworth-Stacker—complete machinery and equipment for the manufacture of plain double cane chairs, etc., (new or used).

Va., Norfolk—L. F. Hobbs, 115 East 12th St.—one 250 ft. span cableway to handle 1 yd. clam shell bucket; one 200 to 250 cu. ft. capacity air compressor, gasoline driven; rock crushing outfit, complete with screens, elevators, etc.; one bag filling machine; 100 factory platform trucks about 2 x 5 ft., (used).

Va., Winchester—The Winchester Lumber Corp.—complete planing machinery and dry kiln equipment.

W. Va., Buckhannon—The Buckhannon Brick Co.—dry kiln equipment consisting of doors, etc., also (new or used) 60 double-deck steel dryer cars, 24 in. gauge.

W. Va., Buckhannon—C. E. Hines—complete woodworking machinery outfit.

W. Va., Charleston—The Bd. Educ.—equipment for vocational department of proposed Junior High School.

W. Va., Princeton—The Bd. Educ., J. V. Woodson, Pres.—equipment for vocational and manual training departments of new high school.

W. Va., Rainelle—The Sewell Valley R.R.—one 36 in. planer; 250 ton wheel press; universal milling machine and 1200 ton steam drop hammer.

W. Va., Wheeling—C. L. Hills, 403 Natl. Bank Bldg., C. L. Hills, Purch. Agt.—two class 14 and one class 24 Bucyrus dragline machines also 20 to 30 four-yard Western, 36 in. gauge, steel draft sill dump cars.

Wis., Algoma—The Algoma Wood Products Co.—woodworking machinery.

Wis., Antigo—The Amer. Dairy Products Co., c/o J. Fronek, Route 2—belt driven separators, mixers and vats, for making cheese.

Wis., Casco—The Casco Milling Co., W. E. Drossart, Purch. Agt.—feed grinding machinery, operated by gasoline engine or electric motor.

Wis., Greenville—E. Schroeder—auto repair equipment for proposed garage.

Wis., Hustisford—The Hustisford Ice Cream Co., Lock Box 42—100 to 200 gal. pasteurizing machine.

Wis., Kewaunee—J. Svoboda—woodworking machinery for proposed furniture factory on Main St.

Wis., Madison—J. A. Brady, 219 East Washington Ave.—equipment for auto repair work.

Wis., Madison—The Madison Gas & Electric Co., 102 East Main St.—monorail crane.

Wis., Marshfield—Blum Bros., 135 West 9th St., P. Blum, Purch. Agt.—one 12 in. jointer; swing cut-off saw, boxboard matcher; stave planer; crozing machine; trusser; equalizer turning lathe all to be with individual electric motor drive.

Wis., Menomonie—The Menomonie Oil Co.—machinery for use in trucks and auto repair shop.

Wis., Milwaukee—The Argo Tool & Machine Mfg. Co., c/o C. E. Helm, Purch. Agt., 345 25th Ave.—two No. 2 milling machines and one Detroit drill.

Wis., Milwaukee—The Barkdoll Candy Co., 924 Center St., J. A. Barkdoll, Purch. Agt.—motor driven beating machines, dippers, coolers, etc.

Wis., Milwaukee—C. Bielefeld, 1161 Grant St.—one 30 in. or 32 in. band saw, boring machine, and 12 in. jointer.

Wis., Milwaukee—T. Dammann, 3115 Clybourn St.—polishing machines, carving machines and saws, (power) for monument work.

Wis. Milwaukee—The Interior Woodwork Co., 521 Park St.—additional woodworking machinery.

Wis., Milwaukee—C. Krusemark, 158 Williams St.—limestone grinding machinery, gasoline or steam engine driven.

Wis., Milwaukee—The Novelty Mfg. Co., c/o O. J. Habbegger, 114 Grand Ave.—machinery for the manufacture of novelty brushes.

Wis., Milwaukee—The Werner Knitting Wks., 397 11th Ave.—laundry machinery including a belt driven ironing machine.

Wis., Omro—A. J. Ihrke—gasoline storage tank and pump for garage.

Ont., Parkhill—Allen & Eagleson—complete equipment for garage and service station.

Wis., Sun Prairie—Chase & Son, F. A. Chase, Purch. Agt.—coal handling machinery.

Wis., Tomah—C. W. Dickover Mfg. Co., C. Dickover, Purch. Agt.—lathe, drill press and motor.

Wis., Watertown—The Klinger Buick Co., 212 South 1st St., F. J. Klinger, Purch. Agt.—lathe, drill press, motor and grinder.

Wis., Watertown—Klinger & Mayer Co., 200 1st St.—equipment for repair shop, including drill, lathe and press.

Ont., Brampton—The Pease Furnace Co.—foundry and general equipment for furnace plant to replace that which was destroyed by fire.

Ont., Markdale—F. T. Hill & Co.—modern flour mill equipment to replace that which was destroyed by fire. Estimated loss, $35,000.

Que., Montreal—The Central Machine & Welding Co., 38 Bronsdon Lane—welding machine and small lathe.

Que., Montreal—The Magnolia Metal Co. of Canada, Ltd., 39 Shannon St.—foundry equipment.

Metal Working Shops

Cal., Burbank—The Amer. Aluminum Metal Products Co., has awarded the contract for the construction of seven 1 story factories covering 60,000 sq.ft. of floor space. Estimated cost, $88,000. Noted Aug. 18.

Cal., Oakland—M. Elsaser, c/o S. Heiman, Archt., 57 Post St., San Francisco, will soon receive bids for the construction of a 1 story, 75 x 100 ft. machine shop on 4th and Washington Sts. Estimated cost, $15,000.

Conn., East Hartford (Hartford P. O.)—F. C. Walz, Archt., 407 Trumbull St., Hartford, is receiving bids for the construction of a 1 story, 80 x 100 ft. garage and service station on Connecticut Blvd., here, for T. Shannon, Russell St., South Manchester. Estimated cost, $40,000.

Conn., Wallingford—H. L. Judd & Co., 42 South Cherry St., has awarded the contract for the construction of a 5 story, 80 x 100 ft. hardware factory on Cherry St. Estimated cost, $125,000. Noted Jan. 26.

Conn., Waterbury—G. W. Russell, 263 Bank St., has awarded the contract for the construction of a 1 story, 60 x 135 ft. garage and salesroom on Cottage Pl. Estimated cost, $40,000. Noted Oct. 27.

D. C., Washington—The Salvation Army, 521 13th St., N.W., will soon award the contract for the construction of an industrial home, garage, baling and repair shops. Estimated cost, $200,000.

Ill., Chicago—A. Johnson, 2812 North Ave., is having plans prepared for the construction of a 4 story, 50 x 138 ft, ice skate factory on North and Francisco Aves. Estimated cost, $100,000. H. A. Anderson, 3116 Sunny Side Ave., Archt.

Ill., Freeport—The Arcade Mfg. Co., 1 Columbus Ave., will receive bids until March 14 for the construction of a 3 story, 56 x 98 ft. factory for the manufacture of hardware specialties. Estimated cost, $35,000. C. E. Wolfley, 610 Stewart Bldg., Rockford, Archt.

Ill., Shelbyville—M. O. Finks plans to build a 1 story, 62 x 80 ft. garage to replace the one destroyed by fire. Estimated cost, $40,000. Private plans.

Ill., Sterling—E. L. Reed Mfg. Co., 10 South Mill St., manufacturer of hardware specialties, has awarded the contract for the construction of a 3 story, 40 x 90 ft. factory. Estimated cost, $500,000.

Ill., Watseka—The Fanyo Garage Co. plans to build a 1 story garage. Estimated cost, $40,000. Architect not selected.

Kan., McPherson—The Pioneer Motor Co. is having plans prepared for the construction of a 1 story, 75 x 140 ft. garage. Estimated cost, $50,000. C. W. Shaver, 159 North Santa Fe St., Salina, Archt.

Mass., Cambridge—The Natl. Bottling Co., 28 School St., Boston, has awarded the contract for the construction of a 1 story, 75 x 135 ft. garage and service station on Washington St., here. Estimated cost, $45,000.

Mass., Holyoke—R. Magna Auto Co. is having plans prepared for the construction of a 2 story, 75 x 100 ft. garage on Northampton St. Estimated cost, $50,000. Private plans.

Mass., Salem—The Hygrade Lamp Co., 60 Boston St., is having plans prepared for the construction of a 4 story, 50 x 100 ft. factory on Boston St. Estimated cost, $75,000. Monks & Johnson, 99 Chauncy St., Boston, Archts.

Mass., Westfield—H. B. Smith Co., 57 Main St., is having plans prepared for the construction of a 1 story, 30 x 140 ft. machine shop. Private plans.

Md., Baltimore—The Continental Garage & Service Corp., 111 North Charles St., has awarded the contract for the construction of a 5 story garage and service station on Monument and Howard Sts. Estimated cost, $275,000. Noted Dec. 22.

Minn., New Prague—The Gopher Mchy. Co. is having plans prepared for the construction of a 1 story, 78 x 100 ft. factory (1st unit). Estimated cost, $40,000. J. C. Niemeyer, 643 Endicott Bldg., St. Paul, Engr.

N. J., Camden—The Standard Tank & Seat Co., 314 North Front St., has awarded the contract for the construction of a 3 story, 32 x 78 ft. metal and woodworking factory at 316 North 4th St. Estimated cost, $30,000.

N. J., West Hoboken—J. Keavy, 357 Palisade Ave., will build a 1 story, 75 x 100 ft. garage on Malone St. Estimated cost $42,000. Noted Dec. 29.

N. Y., New York—M. I. St. John, c/o G. Keister, Archt. and Engr., 56 West 45th St., is having plans prepared for the construction of a 4 story, 125 x 150 ft. garage on the Grand Concourse and 174th St. Estimated cost, $125,000.

O., Cleveland—Coe & Baeher, 1795 East 90th St., have had plans prepared for the construction of a 2 story, 37 x 62 ft. commercial building and garage at 8212 Carnegie Ave. Estimated cost, $40,000. Private plans.

O., Cleveland—C. W. Fessenden, c/o W. J. Wefel, Archt. 624 Union Bldg., has had plans prepared for the construction of a 1 story, 50 x 141 ft. garage at 2392 East 116th St. Estimated cost, $50,000.

O., Cleveland—The Perfection Tire & Repair Co., 3618 West 25th St., is receiving bids for the construction of a 1 story, 40 x 52 ft. garage on Archwood and West 25th Sts. Estimated cost, $40,000. J. L. Cameron, 10406 Euclid Ave., Archt.

Pa., Phila.—L. Blumberg, 235 North 4th St., has awarded the contract for the construction of a 1 story, 50 x 100 ft. garage and a 1 story, 70 x 100 ft. theatre at 510 North 4th St. Estimated cost, $90,000.

Pa., Phila.—Hexfer & Kahn, Morris Bldg., have awarded the contract for the construction of a 1 story, 40 x 237 ft. sales and service station at 5931-35 Broad St. Estimated cost, $90,000.

Pa., Phila.—C. Kohn, Morris Bldg., has awarded the contract for the construction of a 2 story, 125 x 300 ft. factory on Glenwood Ave. and Oxford St., for the manufacture of boilers and radiators. Estimated cost, $85,000.

Pa., Phila.—I. W. Levine, Archt., Liberty Bldg., will soon receive bids for the construction of a 2 story, 50 x 66 ft. repair shop on Hutchinson and Thompson Sts., for the Girard Cycle Co., 1022 West Girard Ave. Estimated cost, $30,000.

Pa., Phila.—H. T. Paiste & Co., 32nd and Cherry Sts., has awarded the contract for the construction of a 4 story, 104 x 108 ft. addition to its factory for the manufacture of electrical supplies. Estimated cost, $100,000.

Pa., Phila.—A. W. Pusey, West End Trust Co. Bldg., has awarded the contract for the construction of a 3 story, 40 x 50 ft. and 3 story, 35 x 120 ft. garage on Girard Ave. and Watts St. Estimated cost, $60,000. Noted March 2.

Pa., Phila.—G. H. Thirsk, 4305 Horrocks St., has had plans prepared for the construction of a 3 story 43 x 289 ft. garage and storage plant on Adams St. and Wingohocking Ave. Estimated cost, $100,000. Private plans.

Pa., Pittsburgh—J. C. Forster & Son, 2519 Penn Ave., are having plans prepared for the construction of a 2 story, 50 x 100 ft. plant for the manufacture of tinware. Estimated cost, $40,000. Private plans.

Pa., Sharon—The Wilton Tool Co., 2121 Grand River Ave., Detroit, Mich., has awarded the contract for the construction of a 1 story, 20 x 100 ft. and 50 x 100 ft. plant here, for the manufacture of tools. Estimated cost, $50,000. Noted Dec. 29.

R. I., Hillsgrove—The Rhode Island Malleable Iron Wks. plans to build a 1 story, 70 x 250 ft. addition to its plant. Estimated cost, $75,000. Private plans.

Wis., Greenville—E. Schroeder has purchased a site on Main St. and plans to build a 1 and 2 story, 50 x 90 ft. garage. Estimated cost, $40,000. Architect not selected.

Wis., Madison—J. A. Brady, 219 East Washington Ave., has awarded the contract for the construction of a 1 story, 61 x 127 ft. garage on Park St. Estimated cost, $40,000. Private plans.

Wis., Menasha—The U. S. Tractor & Mchy. Co., 6th St., plans to build a 2—3 story, 160 x 190 ft. tractor factory. Estimated cost, $200,000. Architect not selected.

Wis., Omro—A. J. Ihrke plans to build a 2 story, 60 x 90 ft. garage. Estimated cost, $40,000. Architect not selected.

Wis., Racine—W. J. Redden, Archt., 2819 Arlington Ave., will soon receive bids for the construction of a 1 story, 85 x 100 ft. garage on West 6th St., for the Jacobson Auto Co., 1713 West 6th St. Estimated cost, $45,000.

Wis., Watertown—Klinger & Mayer Co., 200 1st St., plans to build a 1 and 2 story, 104 x 120 ft. garage and repair shop on 1st St. Estimated cost, $45,000. Architect not selected.

Ont., Brampton—The Pease Furnace Co. plans to rebuild its factory which was destroyed by fire. Estimated loss, $150,000.

Ont., Parkhill—Allen & Eagleson plan to build a garage and service station. Estimated cost, $40,000.

General Manufacturing

Cal., Paso Robles—G. Jacobs, c/o Miller & Warnecke, Archts, Perry Bldg., Oakland, has had plans prepared for the construction of a 2 story baking plant. Estimated cost, between $18,000 and $20,000.

Cal., San Francisco—The Los Angeles Soap Co., 250 Front St., is having plans prepared for the construction of a 3 story, 100 x 160 ft. soap factory on 2nd and Brannan Sts. About $150,000. W. H. Crim, Jr., 425 Kearny St., Archt.

Cal., San Francisco—The Real Estate & Development Co., Hearst Bldg., has awarded the contract for the construction of a 1 story factory on 16th St. near Kansas St., for the Natl. Fibre Form Products Co. Estimated cost, $20,000.

Conn., Hartford—The Imperial Dyeing Wks., 214 Park St., is having plans prepared for the construction of a 1 story, 125 x 130 ft. dyeing plant on Park St. Estimated cost, $50,000. Berenson & Moses, 1028 Main St., Archts.

Ia., Davenport—L. H. Hass, 2103 Greenwood Ave., and C. L. Kruse, have awarded the contract for the construction of a 3 story, 26 x 120 ft. bakery and office building, on 3rd and Brady Sts. Estimated cost, $75,000.

Ill., Decatur—The Builders Lumber Co., 732 North Monroe St., is having plans prepared for the construction of a 2 story, 24 x 170 ft. lumber factory. Estimated cost, $25,000. Private plans.

Ill., Decatur—The Decatur Lumber & Mfg. Co., 666 North Water St., is having plans prepared for the construction of a 3 story factory and warehouse. Estimated cost, $50,000. Brooks, Bramhall & Dange, 208 Natl. Bank Bldg., Archts.

Ill., Jacksonville—The International Shoe Co., c/o A. Hume, 15th and Washington Sts., St. Louis, Mo., is having plans prepared for the construction of a 3 story shoe factory, here. Estimated cost, $50,000. H. Rinehardt, 13th and Mullanphy St., St. Louis, Mo., Archt. Noted Nov. 24.

Ill., Joliet—The Union Coal Transfer & Warehouse Co. plans to build a 1 story, 50 x 160 ft. ice plant and warehouse on Henderson St. Estimated cost, $40,000. A. Lindberg, Genl. Mgr. Private plans.

Ill., Olney—The Sexton Mfg. Co., Fairfield, plans to build a 2 story knitting factory here. Estimated cost, $30,000. Private plans.

Ill., Rockford—The Shurtleff Ice Cream Co., 103 South Main St., is having plans prepared for the construction of a 2 story, 50 x 110 ft. addition to its ice cream factory. Estimated cost, $50,000. F. A. Carpenter, Brown Blk., Archt.

Kan., Newton—The Imperial Laundry has awarded the contract for the construction of a 3 story, 40 x 145 ft. laundry on East 5th St. Estimated cost, $52,000. J. W. Morgan, Prop.

Mass., Attleboro—R. Wolfenden & Sons will build a 1 story, 60 x 230 ft. addition to their dyehouse. Estimated cost, $60,000.

Mass., Canton—The G. Grow Tire Co., 321 Columbus Ave., Boston, has awarded the contract for the construction of a 1 story, 41 x 102 ft. addition to its tire factory, here. Estimated cost, $45,000.

Mass., Graniteville—The Abbot Worsted Co., Westford, has awarded the contract for the construction of a 3 story, 90 x 215 ft. mill, here, for the manufacture of worsted goods. Estimated cost, $150,000.

Mass., Malden—The Yale Knitting Co., Sherman St., is having plans prepared for the construction of a 4 story addition to its knitting mill. Lockwood Greene & Co., 60 Federal St., Boston, Archts. and Engrs.

Mass., New Bedford—Tait Bros., 103 North Front St., plan to build a 2 story ice cream plant. Estimated cost, $40,000. Architect not announced.

Mass., Newtonville—The Security Mills, Inc., West Newton, will build a 1 story, 60 x 150 ft. addition to textile mill on Monroe St., here. Estimated cost, $50,000.

Mass., Peabody—The Danvers Bleachery Co. has awarded the contract for the construction of a 3 story, 60 x 250 ft. bleachery. Estimated cost, $150,000.

Me., Kittery—The Turner Centre Creamery plans to build a 2 story creamery. Estimated cost, $60,000. Private plans.

Me., Springvale—The Goodall Worsted Co. is having revised plans prepared for the construction of a 5 story, 240 x 280 ft. spinning mill and storage building on River St. Lockwood Greene & Co., 60 Federal St., Boston, Mass., Archts. and Engrs.

Md., Baltimore—The Erlanger Underwear Mfg. Co., 527 West Pratt St., has awarded the contract for the construction of a 1 story, 80 x 110 ft. factory on Federal and Castle Sts. Estimated cost, $35,000.

Md., Baltimore—J. H. Geis & Co., Brooklyn (Baltimore P. O.), is having preliminary plans prepared for the construction of a 1 story, 63 x 100 ft. planing mill, here. Estimated cost, $30,000. W. A. White, 2024 North Smallwood St., Archt.

Mo., Fulton—The State School for Deaf and Dumb is having plans prepared for the construction of a 1 story, 50 x 80 ft. laundry. Estimated cost, $25,000. C. I. McNamee, Pres. M. F. Bell, Fulton, Archt.

Mo., Joplin—The Miners Ice & Fuel Co., 318 Main St., plans to build a 2 story ice plant on 10th St. and Kentucky Ave. Estimated cost, $15,000. Private plans.

Mo., Leeds—The Wilson Slaughtering Device Co., 511 Amer. Bank Bldg., Kansas City, will build a 2 story, 30 x 140 ft. steam plant, here. Estimated cost, $50,000. Noted Feb. 9.

N. J., Pleasantville—The Taylor Packing Co. has awarded the contract for the construction of a 2½ story, 100 x 145 ft. meat packing plant. Estimated cost, $75,000.

N. C., Gastonia—A. M. Smyre Mfg. Co. will soon receive bids for the construction of a 2 story, 125 x 300 ft. yarn mill. R. C. Biberstein, 614 Elizabeth Ave., Charlotte, Archt. and Engr.

O., Cleveland—The Brooklyn Ice Co., 3323 Henniger Rd., has awarded the contract for the construction of a 1 story, 35 x 100 ft. ice plant at 3307 Henniger Rd. Estimated cost, $40,000. H. C. Miller, Treas.

O., Cleveland—H. Soeder & Sons Co., 1635 East 38th St., has awarded the contract for the construction of a 2 story, 48 x 105 ft. dairy plant at 1649 East 39th St. Estimated cost, $40,000.

O., Dayton—The Holland Bread Co., 443 West 3rd St., has awarded the contract for the construction of a 2 story, 170 x 250 ft. baking plant on South Ludlow St. Estimated cost, $200,000.

O., Sandusky—The Sandusky Portland Cement Co., Bay Bridge, is receiving bids for the construction of factory buildings. Estimated cost, $100,000. Private plans.

O., West Carrollton—The Amer. Envelope Co. has awarded the contract for the construction of a 2 story paper mill. Estimated cost, $75,000.

Pa., Chester—The Irving Worsted Co. has awarded the contract for the construction of a 1 story, 64 x 100 ft. and 1 story, 52 x 64 ft. weaving factory. Estimated cost, $49,000.

Pa., Chester—The Scott Paper Co. is receiving bids for the construction of a 2 story, 45 x 86 ft. paper factory. Estimated cost, $50,000. Private plans. V. C. Darlington, Chester, Engr.

Pa., Phila.—A. Leebovitz, 1002 North Marshall St., has awarded the contract for the construction of a 2 story, 18 x 65 ft. addition to bottling plant at 999 North Marshall St. Estimated cost, $5,000.

Pa., Phila.—The Lester Piano Co., Lester, has awarded the contract for the construction of a 3 story, 85 x 144 ft. piano factory, here.

Pa., Phila.—Sheplan, Sabol & Palmer, 15th and Wallace Sts., have awarded the contract for the construction of a 4 story, 127 x 153 x 154 ft. factory on 43rd St. and Lancaster Ave., for the manufacture of knitted wear. Estimated cost, $95,000.

Pa., Reading—Lockwood Greene & Co., Archts. and Engrs., 60 Federal St., Boston, Mass., will soon award the contract for the construction of a 3 story, 50 x 400 ft. addition to cotton mill for the Reading Cotton Mills. Estimated cost, between $175,000 and $200,000.

R. I., Westerly—The Westerly Textile Co. will soon award the contract for the construction of a 5 story, 32 x 50 ft. mill. Estimated cost, $40,000. C. T. Main, 201 Devonshire St., Boston, Engr.

Tex., El Paso—Frieje Bros. Magoffin and Williams Sts., have awarded the contract for the construction of a 1 and 3 story, 36 x 120 ft. flour mill. Estimated cost, $10,000.

Va., Pulaski—The Paul Knitting Mills has had plans prepared for the construction of a 2 story, 40 x 77 ft., mill, a 1 story, 40 x 77 ft. dyeing room and a 1 story, 30 x 40 ft. stock room. F. S. Stone, Roanoke, Archt. and Engr.

Wis., Kewaunee—J. Svoboda plans to build a 2 story, 50 x 95 ft. furniture factory on Main St. Estimated cost, $30,000. Architect not selected.

Wis., Milwaukee—H. J. Esser, Archt., 82 Wisconsin St., is receiving bids for the construction of a 2 story, 65 x 160 ft. and 70 x 100 ft. factory and storage plant on Park St., for the Interior Woodwork Co., 521 Park St.